

Microsoft Windows 95 is the most powerful and flexible operating system ever designed for the home and office. It's the only one that lets you do everything you need to do, from managing your files to playing games, all in one place. And it's the only one that's so easy to use, even a child can learn it. Windows 95 is the only operating system that lets you connect to the Internet, so you can get the latest news, weather, and more. It's the only one that lets you share files and printers with other computers on your network. And it's the only one that lets you backup your files, so you can be sure they're safe. Windows 95 is the only operating system that lets you do everything you need to do, from managing your files to playing games, all in one place. And it's the only one that's so easy to use, even a child can learn it. Windows 95 is the only operating system that lets you connect to the Internet, so you can get the latest news, weather, and more. It's the only one that lets you share files and printers with other computers on your network. And it's the only one that lets you backup your files, so you can be sure they're safe.

Windows 95 is the only operating system that lets you do everything you need to do, from managing your files to playing games, all in one place. And it's the only one that's so easy to use, even a child can learn it. Windows 95 is the only operating system that lets you connect to the Internet, so you can get the latest news, weather, and more. It's the only one that lets you share files and printers with other computers on your network. And it's the only one that lets you backup your files, so you can be sure they're safe. Windows 95 is the only operating system that lets you do everything you need to do, from managing your files to playing games, all in one place. And it's the only one that's so easy to use, even a child can learn it. Windows 95 is the only operating system that lets you connect to the Internet, so you can get the latest news, weather, and more. It's the only one that lets you share files and printers with other computers on your network. And it's the only one that lets you backup your files, so you can be sure they're safe.

Windows 95 is the only operating system that lets you do everything you need to do, from managing your files to playing games, all in one place. And it's the only one that's so easy to use, even a child can learn it. Windows 95 is the only operating system that lets you connect to the Internet, so you can get the latest news, weather, and more. It's the only one that lets you share files and printers with other computers on your network. And it's the only one that lets you backup your files, so you can be sure they're safe. Windows 95 is the only operating system that lets you do everything you need to do, from managing your files to playing games, all in one place. And it's the only one that's so easy to use, even a child can learn it. Windows 95 is the only operating system that lets you connect to the Internet, so you can get the latest news, weather, and more. It's the only one that lets you share files and printers with other computers on your network. And it's the only one that lets you backup your files, so you can be sure they're safe.

Make Windows Work for You

- Manage your files and folders
- Connect to the Internet
- Share files and printers
- Backup your files
- Play games and watch movies



Word for
Windows
redefines
the word
processor.

The only tab you'll need.

With the Tables feature you can easily format numbers and words into neat little rows and columns. Even change row or column dimensions with a quick point and drag. Best of all, there's no messing around with tabs.

Tie your data together.

With dynamic data exchange, you can paste data into a Word document and watch it get updated when changes are made to the original file. Automatically. So you won't get tied up doing manual updates.

Save time.

Document Templates make it quick and easy to create standard letters, memos and more. Ensuring consistency. As well as company standards.

Tailor your documents.

With a point and click, icons on the Ribbon and Ruler allow you to fashion formats from basic to sophisticated. You can even save these formats as a personal style or company standard.

Only your cobbler knows for sure.

The WYSIWYG and Print Preview features save you something beyond a few trips to your local printer. Something known as the soles of your shoes.

It Ain't Over 'Til



The ALR[®] BusinessVEISA[™] 486/25 Model 80 25-MHz, i486[™], Fully-Equipped, EISA & Upgradeable



\$4195

For about the same price that you'd pay for many "bare-bone" systems, ALR gives you a fully-equipped, EISA-based, 25-MHz i486 system. Whether you're looking for a powerful CAD engine or a fast platform for Windows[™], this system is literally plug and play; just add software!

Your Programs Never Looked Better...

The Model 80 comes standard with an 800x600 Super VGA display adapter and a dual frequency ALR FlexVIEW/2X monitor. With popular programs such as AutoCAD[™], Lotus 1-2-3[™], Ventura Publisher[™], and others, you'll be able to see more information on the screen in more colors.



Of course, you'll need somewhere to store all your pro-



grams. That's why the Model 80 comes standard with a fast (<19ms) 80-MB hard drive. You'll have plenty of room for your favorite environments and applications.

"Just Upgrade the CPU!"[™]

ALR's BusinessVEISA has one more feature that the others don't, ALR's proprietary VEISA architecture. This unique modular design

lets you Just Upgrade the CPU! whenever you need more processing power. VEISA architecture also lets you plug in optional external CachePAK modules for added performance in memory-hungry environments such as Windows or OS/2[™].

ALR BusinessVEISA 486/25		AST ® Bravo™ 486 5V	
25-MHz i486		25-MHz i486	
2-MB		2-MB	
5.25" Floppy		5.25" Floppy	
Super VGA Adapter		Super VGA Adapter	
32-Bit EISA Bus		16-Bit ISA Bus	
Model 80 also includes:		\$3995 List Price 5V	
80-MB Hard Disk	INCL	\$795	80-MB Hard Disk
Super VGA Monitor	INCL	\$745	Super VGA Monitor
3.5" Floppy	INCL	\$150	3.5" Floppy
Upgradeable CPU	YES	N/A	Upgradeable CPU
Optional External Cache	YES	N/A	Optional External Cache
\$4195		\$5685	
Look for the fully configured system!			

The Fat Lady Sings...

Every ALR BusinessVEISA delivers a true, 32-bit, EISA bus. You can take advantage of the best multi-mastering and I/O enhancement products of today and tomorrow.



..Or Until You've Seen ALR's BusinessVEISA

So Don't Say Bravo™ Yet.
The ALR®
BusinessVEISA™ 386/33
Model 101
33-MHz, 386DX™, EISA &
Upgradeable

\$1995

"Just Upgrade the CPU!"



With a list price of just \$1995, it's no wonder that the ALR BusinessVEISA 386/33 Model 101 has taken the business world by storm. For less than you'd pay for many old-style 20-MHz 386SX™

systems, you get a full 33-MHz 386DX™ processor and a cutting edge, 32-bit, EISA bus. Factor in ALR's unique VEISA processor upgrade path, and you have an unbeatable value.

You want to get the most for your money and BusinessVEISA delivers just that.

For your nearest authorized ALR Reseller, call:
1-800-444-4ALR

CIRCLE 165 ON READER SERVICE CARD
9401 Jeronimo Irine, CA 92718
(714) 581-6770 FAX: (714) 581-9240

ALR BusinessVEISA 386/33 Model 101 VEISA Architecture 33-MHz 386DX 32-Bit Data Path 1-MB 32-Bit EISA Bus \$1995 25-MHz 486 Upgrade \$1995	AST Premium™ II 386SX/20 Model 5V Cupid-32 20-MHz 386SX 16-Bit data Path 2-MB 16-Bit ISA Bus \$2595 25-MHz 486 Upgrade \$4995
Look for the real 32-bit system!	



Available at these selected resellers:

ALR Power Partner Resellers

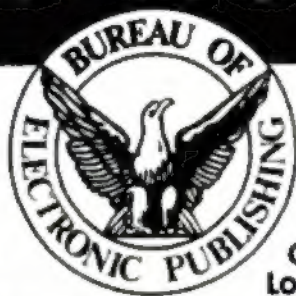
Connecting Point™

COMPUTER CENTERS

SEI

Prices and configurations subject to change without notice - verify competitive pricing with manufacturer. Prices based on U.S. dollars. ALR is a registered trademark, and BusinessVEISA and VEISA are trademarks of Advanced Logic Research, Inc. All other brand and product names are trademarks or registered trademarks of their respective owners. © 1990 by Advanced Logic Research, Inc.

CD-ROM



NEW!

Guaranteed
Lowest Prices!

U.S. HISTORY ON CD-ROM

Full text of 107 U.S. History books
with 1,000 images, tables & maps!
U.S. History on CD-ROM disc \$395

CD-ROM BUNDLE! Get The New Philips CM-50 CD-ROM Drive Kit And 6 Discs - Only \$689

*****SAVE OVER \$1200*****

Microsoft Bookshelf best seller
U.S. History on CD-ROM 107 books
Sherlock Holmes on Disc 221 Baker St. fans
Shakespeare on Disc "complete"
Birds of America pictures and sounds
Software Potpourri • King James Bible
Movie Database

CD-ROM Drives (ready to run)

Hitachi Drives- all models, PC and Mac From \$599
NEC CDR-73 or 83 or 36 CD-ROM Drive From \$499
Sun Moon Star CD-ROM Drive Bundle with 7 discs Call
Pioneer Minichanger CD-ROM Drive complete kit Call
800 MEGABYTE WORM less than \$0.18 per MBI 3,495
Also: Denon, Chinon, & Sony drives, Best Price - Call!

Business

C Library or Ada or Shareware Grab Bag \$89
CIA World Fact Book perfect for international "business" 99
World Atlas color maps and statistics throughout world Call
Microsoft Bookshelf all time best selling CD-ROM disc 199
PC-Sig Library new edition, version 8 465
Countries of the World over 100 reference books 495
Telephone Directory East or West 995

Libraries and Science

Birds of America includes pictures and sound \$99
Grollier's Encyclopedia 21 volumes, VGA pictures Call
Medical Year Book on Disc full text of 1989 Year Books 195
McGraw-Hill Ref. Set 100,000 terms; 7,300 articles 245
Wordcruncher Disc entire works of 8 authors 249
Pediatrics on Disc 5 years of journal Pediatrics, 1983-89 395
Mammals includes pictures & text Call
Library of the Future Over 50 Authors, 450 titles Call
Oxford Textbook of Medicine general medical reference 595
Oxford English Dictionary over 250,000 headwords! 889
Compton's Multi-Media Encyclopedia rave reviews 895

Miscellaneous

Movie Directory Database/Software Potpourri \$49
Between Heaven & Hell II even stranger 99
Sherlock Holmes or Shakespeare on Disc "complete" 99
Sporting News Baseball CD a sports fans dream 149
Guinness Book of World Records Multi-media PC & Mac Call

**** MORE! Over 300 different titles available ****

Free CD-ROM Product Guide with every order

Money back guarantee Free tech support

CALL - Bureau On-Line CD-ROM Library,
FREE access to 12 different CD-ROM Discs



FEDERAL
Express

Overnite
Delivery

**Bureau of
Electronic Publishing, Inc.**

Dept. P, 141 New Road, Parsippany, NJ 07054
Fax # 201-808-2676

Call: 1-800-828-4766 orders only
(201) 808-2700 information

CIRCLE 180 ON READER SERVICE CARD

Inside

Since its splashy debut last May, *Microsoft Windows 3.0* has gone on to become the software hit of the year. Whether or not you're a convinced devotee of the GUI gospel, expect to see *Windows* at the center of industry developments.

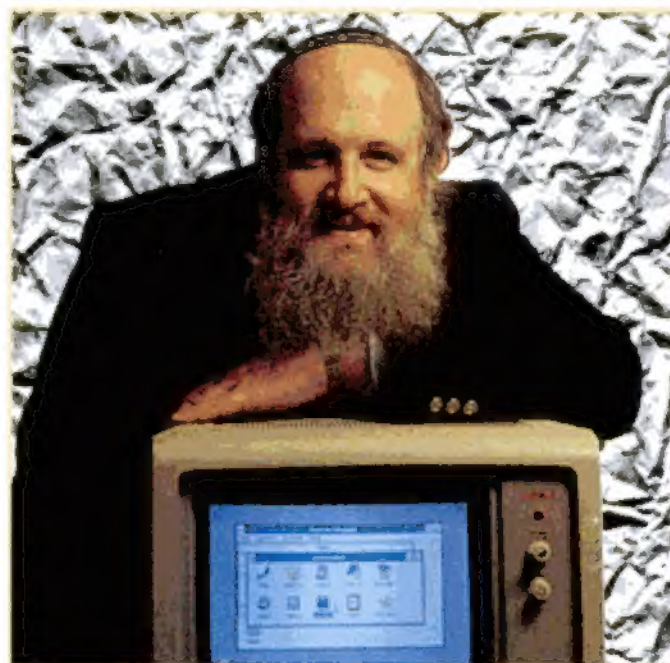
PC Magazine gave you a lengthy preview of *Windows 3.0*'s potential in its September 11, 1990, issue. Now, six months later, it's time to take a look at what has emerged. In this, our first special section devoted to *Windows*, you will find a host of advice for making *Windows 3.0* easier, faster, and more productive to use.

Windows is a complex beast, and there is much to know about it. A lion's share of the help and enthusiasm behind our coverage came from contributing editor Barry Simon. A professor of physics at the California Institute of Technology, Simon has long been the man to see for reviews of technical and scientific software, and he is a regular contributor to our First Looks section as well. Having discovered the productivity benefits of *Windows* early in the days of Version 2, he has mastered its workings. You'll find the benefits of his experience (and that of other *PC Magazine* staffers and contributors) in our opening story, a compilation of the best performance-enhancing tips for *Windows 3.0*: everything from optimizing memory usage



to enhancing disk management. Simon is also a former president of the Association of Shareware Professionals, and he helped us enormously in the job of finding the increasing number of commercial and shareware utilities that are becoming available for *Windows 3.0*. Look to our second article for a host of products that extend or improve the capabilities of *Windows*' own shells and accessories. Since the performance of your video subsystem makes a vast

difference in the perceived and actual performance of *Windows 3.0*, our hardware team rounded up a selection of video boards ranging from plain VGA cards to the latest co-processor-based screamers, and then put *Windows* through its paces. And our connectivity



Contributing editor Barry Simon, *Windows* maven extraordinaire, helped us to put together our *Windows* tips and utilities coverage.

team delivers a report on products that help you to link your *Windows*-based PC to IBM mainframes via 3270-type terminal emulation.

Rounding out the issue are a review of plain-paper fax systems, a look at financial modeling software, and a spotlight on IBM's new PS/2s. Though the days when a new computer from IBM created a revolution in the industry are long gone, the new PS/2 Models 90 and 95 have plenty to spark your interest, including built-in SCSI controllers and a new video standard, XGA, that promises to get beyond the limitations of 8514/A.—Rock Miller ■

PC Magazine: The Independent Guide to IBM-Standard Personal Computing, ISSN #0888-8507, is published biweekly except in July and August for \$44.97 for one year. Ziff-Davis Publishing Co., a division of Ziff Communications Co., One Park Ave., New York, NY 10016. Second-class postage paid at New York, NY 10016 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80321-4093.

PostScript Power To The People!

The QMS-PS® 410 Printer. Developed by the greatest minds in the industry. . . Yours.

Before creating the QMS-PS 410, we performed one very important task. We listened. Then we took everything we heard, added a few surprises, and built a revolutionary laser printer with a suggested retail price of just \$2795!*

You said make it Adobe® PostScript®. So we did. And now you can enjoy the design flexibility only PostScript offers as well as 45 resident typefaces and thousands of PostScript software applications.

You said make it reliable. So we used the Canon® LX print engine manufactured by the world leader in high-quality, easy-maintenance print engines.

You said make setup easy. So we made it truly and completely plug-and-play. Out of the box, it connects to IBM® PC and compatibles, Apple® Macintosh® and mini and mainframe computers.

You said make it flexible. So we added HP® LaserJet® Series II emulation to support non-PostScript printing applications.

You said make it simple. So we gave the QMS-PS 410 the intelligence to actually "think for you" by automatically switching between emulations and interfaces! This printer has ESP (Emulation Sensing Processor) technology,[†] which interprets incoming data and *automatically* chooses the appropriate printer language. And you can send data *simultaneously* to its AppleTalk®, serial and parallel interfaces! There's no need to change switch settings or send complicated software commands.

You said make it fast. So we created a super-fast controller with a 68020 processor and third generation QMS® ASAP™ (Advanced Systems Architecture for PostScript) technology, which incorporates the latest in component and controller design.

You said make it expandable. So we made a variety of options available, including an HP-GL® emulation card, Adobe typeface cards, HP-compatible font cards, memory upgrades and extended paper handling capabilities.



POSTSCRIPT®

**Call Now and Let the QMS-PS 410
Liberate You - Just \$2795!**

1-800-523-2696

You see, listening to you gave us the insight to develop a printer that offers real world solutions to real world problems. And the QMS-PS 410 delivers PostScript power to the people by giving you more solutions than any other printer on the market. Affordable. Reliable. Flexible. Solutions that set you free!



The following are trademarks or registered trademarks of their respective companies: QMS, the QMS logo, QMS-PS and ASAP of QMS, Incorporated. IBM of International Business Machine, Incorporated. Adobe, PostScript and the Adobe PostScript logo of Adobe Systems, Incorporated. Canon of Canon USA, Incorporated. Apple, AppleTalk and Macintosh of Apple Computer, Incorporated. HP, HP-GL and LaserJet of Hewlett-Packard Company.

*U.S. Suggested list price \$2795

†Patent Pending

CIRCLE 259 ON READER SERVICE CARD

UP FRONT

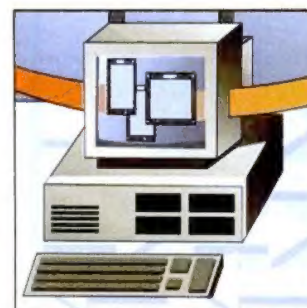
- 4 INSIDE**
- 15 LETTERS**
- 27 ADVISOR**
Gus Venditto/ Quiet a noisy PC; use both *DESQview* and *Windows* without separate *CONFIG.SYS* files.
- 33 FIRST LOOKS**
 - **ObjectVision:** Borland's killer app lets nontechnies visually create applications.
 - **Autodesk's 3D Studio** brings workstation-quality animation to PCs.
 - **NewTek's Video Toaster** turns an Amiga into a stunning PC peripheral.
 - **Cumulus GLC:** A great little computer for home/office.
- 55 NEW AND IMPROVED**
Cristina Córdova and Nathaniel Zelnick
- 65 READ ONLY**
Matthew J. Ross
- 67 PIPELINE**
Gus Venditto

COLUMNISTS

- 75 BILL MACHRONE**
A Day (or Two) in the Life
- 81 JOHN C. DVORAK**
Comdex: Just Say No
- 83 Inside Track**
- 87 JIM SEYMOUR**
Graphical Isn't Necessarily Better
- 95 WILLIAM F. ZACHMANN**
Corporate E-mail and Bulletin Boards

COVER STORY

- 102 Making the Most of Windows 3.0**
Edward Mendelson/ This four-section special looks at *Windows* from every angle and gives you suggestions for taking advantage of everything *Windows 3.0* has to offer.
- 105 Tips, Tricks, and Hints for Windows 3.0**
Don Willmott/ Presenting 35 useful pieces of advice for optimizing every aspect of your *Windows* environment.
122 Memory Matters
- 135 Windows Your Way: 41 Utilities for Windows 3.0**
Tom Unger/ An army of utilities extends your control over *Windows* to make your *Windows* desktop truly your own.
 - 137 Program Management Utilities**
Paul Murphy
137 Aporia
138 Command Post
138 METZ Desktop Manager
139 METZ Task Manager
140 SmartWin
140 Windows Express
 - 148 File Management Utilities**
Ronni Geist and Harry Geist
148 BeckerTools
149 Dragnet and Prompt
152 Pubtech File Organizer
 - 158 Accessories**
Tom Unger
158 Almanac
158 DeskTop Set
164 FirstApps
166 WinSleuth
 - 168 Screen and Mouse Enhancers**
Barry Simon
168 WideAngle
 - 176 Macro Utilities**
M. David Stone
176 Bridge Tool Kit
180 Pubtech BatchWorks
180 Tempo For Windows
 - 187 Text Editors**
Barry Simon
187 Pubtech Text Editor
187 SpeedEdit
 - 191 Icon Editors**
Laura Cox
191 IconDraw
192 PBIcon
 - 192 Network Utilities**
Rock Miller
197 Windows Workstation
 - 136 Editors' Choice**
146 Features Table
- 207 Boosting Video Performance Under Windows 3.0**
M. David Stone/ You've got the 386 system; you've got the memory; now it's time to find the right display system for *Windows*. PC Labs tests a wide sampling of video boards to identify the performance trends that will guide your buying decision.
 - 208 Coming to Terms with Video: A Glossary**
 - 212 From MDA to XGA: A Guide to Video Standards**
 - 218 XGA: IBM's New Hi-Res Spec**
 - 224 Performance Tests**
- 241 3270 Emulation the Easy Way Under Windows 3.0**
Frank J. Derfler, Jr., and Randol Tigrett/ *Windows* provides the ideal interface for PC users who connect to IBM 3270 Series mainframes. PC Magazine LAN Labs evaluates five packages that can display multiple sessions of 3270 programs on-screen simultaneously and exchange data between PC and mainframe applications.
 - 246 Extra! for Windows**
 - 247 IRMA WorkStation for Windows**
 - 254 LinkUp 3270 COAX Window UniSession**
 - 260 Netlogic W3270 Support Package**
 - 272 Rumba**
 - 243 Editors' Choice**
 - 244 A Look at the Terminal Cluster Controller**
 - 256 Features Table**
 - 264 Performance Tests**



FEATURES

287 COMPUTERS

IBM PS/2 Models 90 and 95: True 486 Power at Last
Winn L. Rosch/ They may be late to the party, but IBM's new 486-based PS/2s promise to be lively competitors.

289 Under the Hoods of the New PS/2s

290 IBM's Slim High Drive: New Tricks for an Old Form Factor

293 Performance Tests

298 When You Need More Gigabytes: Drive Array Subsystems from Core

301 IBM's P75 Puts a Handle on 486 Power

306 OS/2 1.3: Faster, Slimmer, and Better-Looking

313 COMMUNICATIONS

Plain-Paper Fax Devices: No Curls, No Shine, No Problem
Frank J. Derfler, Jr./ PC LAN Labs tests three affordable devices that allow you to print high-quality faxes on your laser printer without buying a pricey standalone plain-paper machine.

315 Extended Systems FaxConnection 5011A

316 JetFax

319 Tall Tree Systems Fax-o-Matic

314 Features Table

315 Editors' Choice

319 Performance Tests

322 Tefax: The Versatile Do-It-All Faxon

327 SOFTWARE

The Price Waterhouse Report: Financial Modeling Software
Mike Falkner/ Financial modeling packages are packed with tools that let you analyze your business plans easily, without any of the hassles of complicated, tedious spreadsheet formulas.

330 Business Wits

332 Encore Plus

335 Financial Wonder

345 The Mobley Matrix

328 Editors' Choice

334 TM/1 and Compete: Far Beyond Spreadsheets

AFTER WORDS

459 AFTER HOURS

The first installment in our annual two-part look at tax-preparation software. Our expert evaluates four packages and gives a progress report on the IRS's ambitious electronic filing program.

470 ABORT, RETRY, FAIL?

Bill Howard

374 PC MagNet News

414 Direct Marketing Connection

436 Marketplace Reader

421 Service Card

458 Coming Up

456 Index to Advertisers

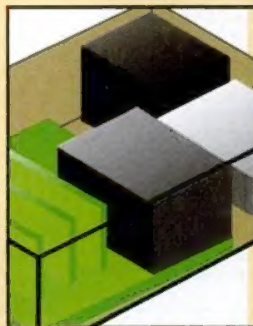
455 Editorial Product Index



PRODUCTIVITY

351 LAB NOTES

Winn L. Rosch/ What You Should Know About the FCC Emission Standards



Components that will be connected together must be certified together by the FCC.

359 UTILITIES

Douglas Boling/ MBOOT.COM: A Multiple Boot Program for Your PC

375 ENVIRONMENTS

Charles Petzold/ An Introduction to the Windows 3.0 Palette Manager

385 POWER PROGRAMMING

Ray Duncan/ DOS Extenders Old and New: Protected-Mode Programming in DOS

395 WINDOWS

William S. Hall/ You can't depend on the position of objects, so stick with the keyboard when using the Macro Recorder; assigning an icon to SYSEDIT.EXE; TSRs won't steal memory from your Windows sessions if you load a DOS shell that runs its own AUTOEXEC.BAT file.

399 DATABASES

Sal Ricciardi/ Fast, flexible techniques for padding numeric strings; incorporate custom color selection into your Clipper applications.

403 SPREADSHEETS

Craig Stinson/ Calculate the difference between two dates with a 1-2-3 formula that adheres to rules of the American Securities industry; transform Excel's stacked bar charts into an inexpensive project-management tool.

411 THE WORKING WORD

Costa Rodis/ Add ASCII characters to your documents with four simple keystrokes; merge all your graphics into one WordPerfect file for easier viewing; import DOS information into your Microsoft Word documents.

413 USER-TO-USER

Neil J. Rubenking/ Using FIND with the /C switch makes it possible to analyze and act on DOS output; here are some batch files that make it easy to rotate several sets of backups.

415 TUTOR

Jeff Prosize/ If your floppy disk drive doesn't recognize disk changes, there's a way to trick DOS so that it will; an updated version of WHATCPU.COM.



Editor-in-Chief and Publishing Director Bill Machrone

Executive Editors Bill Howard, Gus Venditto

Workgroup Systems Editor Frank J. Derfler, Jr.

Senior Editors Trudy Neuhaus (Productivity), Robin Raskin (First Looks)

Senior Editor, West Coast Christopher Barr

Managing Editors Diane D'Angelo, Paul B. Ross

Manager, Copy Edit Karen A. Carter **Associate Editors** Julie Cohen (PCs), Mary Kathleen Flynn (Hardware), Jonathan Matzkin (After Hours), Rock Miller (Graphics), Sharon Terdeman (Productivity), Don Willmott (Software), Jennifer Zaino (Connectivity) **Technical Editor** Neil J. Rubenking **Copy Chief** Glen Becker **Assistant Production Editors** Jeanne Albrecht, Alan Cohen, Wendy Murch **Staff Editors** Michael Cohn, Gayle C. Ehrenman, Carol Levin, Oliver Rist, Matthew J. Ross, Ann Sherman, Craig L. Stark, Tom Unger **Assistant Editors** Karen Best, Robin B. Bornstein, Cristina Córdova, Gavin Edwards, Stephanie Izarek, Catherine Kunkemueller, Elyn McCasland, Michael W. Muchmore, Ann Ovodow, Kim Schueler, Shari L. Serio **Editorial Assistants** Eric Berlin, William P. Flanagan, Angela Gunn, Emerson A. Torgan, Susan Paige York, Nathaniel Zelnick **General Business Manager** Tom McGrade **Associate Business Manager** Allen Wollman **Network Manager** Joseph F. Rizzo **Librarian** Thomas W. Giebel **Assistant to the Publishing Director** David Baker **Assistant to the Executive Editors** Christina M. Evelyn **Administrative Assistants** Christina Okang, Freida T. Smallwood **Database Assistant** Dolores Williams

Contributing Editors Frank Bican, Douglas Boling, Bruce Brown, Ray Duncan, John C. Dvorak, Mitt Jones, Stephen Manes, Michael J. Mefford, Edward Mendelson, Bill O'Brien, Charles Petzold, Alfred Poor, Jeff Proise, Winn L. Rosch, Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone, Ethan Winer, William F. Zachmann

Support Associate, PC MagNet Christopher T. Parker **Synops, PC MagNet** Rick Ayre, Jesse Liberty

Director, Design and Electronic Publishing Gerard Kunkel

Art Director Jerry Tortorella **Associate Art Directors** Charles Conover, Patricia Isaza, Mariano Nicieza, Robert C. Smith **Assistant Art Director** Renata Gomes **Associate Graphics Director** Gary W. Kaplow **Electronic Graphic Artists** Simone Blank, David Foster, Michael L. Graham

Director, PC Labs C. James Galley III

Technical Director, PC Labs Robert W. Kane **Manager, PC Labs** Bruce Freeman **Project Leaders** Gabrielle Gagnon (Software), Lori Grunin (Graphics), Wendy Dugas Pérez (PCs), Randol Tigrett (Connectivity), **Senior Programmer** Stuart R. Greenberg **System Support Manager** Charles Rodriguez **System Support Specialists** Mario Baldasserini, Stephen W. Plain **Lab Assistants** Laura Cox, Bradley G. Epranian, Carolyn Falconer, Margaret A. Piemonte **Inventory Control Manager** John R. Delaney **Inventory Control Coordinators** Peter Bastide, Rob Graydon, John Jones **Secretary** Ann Jo Sanchez

Publisher Ronni Sonnenberg

Director, Marketing Ellen Atkinson **Events** Stacy O'Connell **Market Information** Michael Van Engen **Sales Development** Jeff Stanley **Promotion** Kurt Flamer-Caldera **Subscriptions** Charles Mast **Single Copy Sales** James E. Gerth

Assistant Production Director John Ansaldi **Advertising Production Manager** Vicki Egan Root **Editorial Production Coordinators** Kevin S. Fagan, Jo-Ann Hirschel **Production Systems Supervisor** Linda Harms **Production Systems Assistant** Lillian Gaffney

Advertising Office: One Park Ave., New York, NY 10016; (800) 33 MAG AD, (212) 503-5100
Subscription Problems: (800) 289-0429, (303) 447-9330 (outside the U.S.)

ZIFF-DAVIS PUBLISHING COMPANY

President William B. Ziff, Jr.
Executive Vice President Eric Hippeau
Senior Vice President J. Scott Briggs
Senior Vice President, Marketing Paul H. Chook
Group Vice President, PC Publications J. Scott Briggs
Group Vice President, Mac Publications J. Samuel Huey
Group Vice President, Direct Publications Jim Stafford
Vice President, Operations Baird Davis
Vice President, Business Manager T.L. Thompson
Vice President, Controller Howard D. Sckolnik

ZIFF COMMUNICATIONS COMPANY

Chairman William B. Ziff, Jr.
Vice Chairman Philip B. Korsant
President Kenneth H. Koppel
Executive Vice President Philip Sine
Senior Vice President Hugh Tietjen

Vice President, Circulation Bert Lacy
Vice President, Circulation Services James Ramaley
Vice President, Creative Services Herbert Stern
Vice President, Marketing Services Ann Pollak Adelman
Vice President, Production Roger Herrmann
Vice President, Research Marian O. White
Vice President, International Frank Kelcz
Director, Classified Sales Paul Stafford
Director of Planning Gary A. Gustafson
Production Director Walter J. Terlecki
Licensing Director Jean Lamensdorf

Vice President, General Counsel, and Secretary J. Malcolm Morris
Vice President, Controller, and Treasurer Patrick J. Burke, Jr.
Vice President, Human Resources Rayna Brown
Vice Presidents Seth R. Alpert, Steven C. Feinman, William L. Phillips

Editorial and Business Office: One Park Ave., New York, NY 10016. Editorial: (212) 503-5255; Advertising: (800) 33 MAG AD, (212) 503-5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered trademark of International Business Machines Corp. Entire contents copyright ©1991 Ziff-Davis Publishing Co., a division of Ziff Communications Co. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are registered trademarks of Ziff Communications Co.: PC, PC Magazine, PC Labs, PC MagNet, PC Magazine Award for Technical Excellence, PC Magazine Editor's Choice Award. The following are trademarks of Ziff Communications Co.: Abort, Retry, Fail?; Connectivity; Databases; Direct Marketing Connection; First Looks; New and Improved; Advisor; Lab Notes; PC Marketplace; Pipeline; Tutor; The PC Utilities; Power Programming; Power User; Read Only; Spreadsheets; User-to-User; The Working Word.

HOW TO CONTACT THE EDITORS

The editors of *PC Magazine* want to hear from you. Please send your questions, complaints, compliments, and submissions to *PC Magazine*, One Park Ave., New York, NY 10016. Send electronic mail to MCI Mailbox 157-9301 (*PC Magazine*) or PC MagNet (see below). *PC Magazine's* general number is (212) 503-5255. The West Coast Operations number is (415) 378-5500. For other Ziff-Davis publications, call (212) 503-3500.

We are unable to look up stories from past issues, recommend products, or diagnose problems with your PC by phone. If you bought a product advertised in *PC Magazine*, are dissatisfied, and can't resolve the problem, write (do not call) Cathy Streicher, Advertising Department, at One Park Ave. Include copies of correspondence.

PC Magazine is under no obligation to review unsolicited products. All submissions accepted for publication become the property of *PC Magazine*. We will pay \$50 for Productivity user tips and Abort, Retry, Fail? submissions. For submissions to Abort, Retry, Fail?, if you send artwork for possible reproduction, mark the funny part on a photocopy, not the original.



PC MAGNET: PC MAGAZINE'S ON-LINE SERVICE

PC Magazine operates PC MagNet, an on-line service where readers can find the utilities published in each issue, download an index of reviews, share opinions with the editors, and access *Computer Library*. To join, set your communications software for either 300 or 1,200 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial (800) 346-3247. (In Canada, call (800) 635-6225, voice only.) When the modem connects, press <Enter>. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

After you have found the phone number, hang up and dial using the number you just found. When you connect with PC MagNet, press Ctrl-C. At the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and Z10D9000 at the ENTER AGREEMENT NUMBER prompt. CompuServe members can join by entering GO PCMAG at any CompuServe prompt. To upload a letter, type GO PCM:FORUMS. For Customer Service, call (800) 848-8990. PC MagNet costs \$12.80 per hour via MasterCard, VISA, or American Express.

PERMISSIONS, REPRINTS

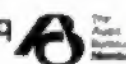
Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine's* logo in conjunction with an Editors' Choice designation, write Chantal Lavelanet; for information on reprints, write Claudia Hardison.

SUBSCRIPTION QUESTIONS

If you want to subscribe to *PC Magazine*, if you have a question about your subscription, or if you're moving, call or write: *PC Magazine*, P.O. Box 54093, Boulder, CO 80322; (800) 289-0429, (303) 447-9330 (outside the U.S.). A 1-year subscription (22 issues) costs \$44.97. Canada and foreign: add \$31.00 per year. New subscriptions and address changes take 6 to 8 weeks to process. For back issues (subject to availability) write Back Issues Department, Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131. Send \$8 per issue (check or money order); \$9 outside the U.S.

PC MAGAZINE REVIEWS

Except where noted: All *PC Magazine* reviews are of currently available products. Comparative reviews are arranged alphabetically by product name for software, by company name for hardware. Software is free from copy protection. On benchmark test charts, shorter bars indicate faster products (less time to complete a task). Benchmark and performance tests are run on Compaq 386/25s.





HIGHLIGHTS

- 80C286 12MHz Microprocessor
- 6 lbs. Total Weight
- 1Mb RAM (expands to 3Mb on system board)
- 80Mb Hard Disk Drive
- 1.44Mb Floppy Disk Drive
- Pre-Loaded with MS-DOS 4.01
- Slim 2" Notebook Size
- Up to 4 Hours Operation Time
- Battery & Recharger Included

Complete 286/12 VGA System with 1Mb RAM, 80Mb Hard Drive, and Floppy Drive Just \$57 Mo!

\$1890

Where can you get a 6 lb., 2" tall, fully-loaded notebook... including a hard drive, floppy drive, VGA screen, and battery? From Austin! Check out our two brand new Austin Notebooks... heavyweight power packed in a very lightweight case. But the best part is, they're also light on the price!

Lighten Up With Austin.



HIGHLIGHTS

- 80386SX 20MHz Microprocessor
- 6 lbs. Total Weight
- 2Mb RAM (expands to 4Mb on system board)
- 80Mb Hard Disk Drive
- 1.44Mb Floppy Disk Drive
- Pre-Loaded with MS-DOS 4.01 Software
- Slim 2" Notebook Size
- Up to 3 Hours Operation Time
- Battery & Recharger Included

Complete 386/SX20 VGA System with 2Mb RAM, 80Mb Hard Drive and Floppy Drive Just \$78 Mo!

\$2690

Only 6 lbs.

AUSTIN 386/SX20 & 286/12 NOTEBOOKS

STANDARD FEATURES

- VGA Monitor Port for External Monitor, Printer Port, and 2 Serial Ports
- Modem/Fax Slot and RAM Expansion Slot
- Real-Time Clock and Calendar

KEYBOARD

- 82 Key Keyboard
- Full-Size Embedded Numeric Pad with 12 Function Keys

VIDEO DISPLAY

- Brilliant 10" VGA Diagonal Display with 640 X 480 Resolution

OPERATION FEATURES

- Suspend/Resume Mode
- Video/Audio Low-Battery Warning Indicator
- Recharges with AC Adapter



1-800-752-1577

VARS 1-800-338-1569 • GSA 1-800-833-4477
New Hours • All Time Zones • Mon-Fri 7am-7pm • Sat 10am-5pm

With our Complete operation under one roof, you can be assured your order receives a complete follow-through from the first moment you call.



When you own an Austin computer, you get lifetime technical support. If you ever have a question, just call our highly trained Technicians. You'll get answers you can rely on, free-of-charge, six days a week.





FCC Class B

HIGHLIGHTS

- 80386/DX Intel 95MHz Microprocessor
- 2Mb RAM (Expands to 16Mb with high speed memory slot)
- 125Mb Super-Fast IDE Hard Drive with 32K Cache
- 14" Super VGA Color Monitor with 1024 x 768 Resolution
- Super-Charged VGA Video Adapter with 512K VRAM
- Pre-Loaded with Microsoft Windows 3.0 and MS-DOS 4.01
- Microsoft Mouse
- Complete System only \$2890!

"Austin's 386/25 WinStation is a system loaded with value, with the added benefit of top-level customer service and support policies." PC Magazine, 386/25 Editor's Choice Review. This full-blown 386 comes with 2Mb RAM, 125Mb hard drive

with 32K cache, 1024 x 768 resolution VGA color monitor and GE on-site service.

AUSTIN 386/25 WINSTATION

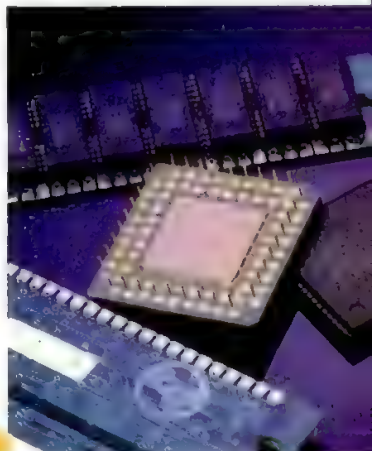
STANDARD FEATURES

- Floppy Drive (1.44Mb or 1.2Mb)
 - Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
 - 7 Expansion Slots (1 8-bit and 6 16-bit)
 - 80387 Math Coprocessor Socket
 - 1 Parallel and 2 Serial Ports
 - Enhanced 101 Keyboard with Tactile/Click Touch
 - RealTime Clock with Battery Backup
 - Small Footprint Chassis
 - Compatible with DOS, OS/2, and Unix
- Complete 1024 x 768 Super VGA Color System with 125Mb Hard Drive, 2Mb RAM and GE On-Site Service... Just \$87 Mo!

\$2890

AUSTIN 386/25 UPGRADE OPTIONS

- Upgrade to an Ultra-Fast 175Mb Hard Drive with 32K Cache. \$400
- Additional 2Mb RAM \$200
- Additional Floppy Drive. \$79



AUSTIN 386/33 WINSTATION

STANDARD FEATURES

- Floppy Drive (1.44Mb or 1.2Mb)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- Intel 80387 or Weitek 3167 Math Coprocessor Socket
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- RealTime Clock with Battery Backup
- Compatible with DOS, OS/2, and Unix

Complete 1024 x 768 Super VGA Color System with 125Mb Hard Drive, 4Mb RAM and GE On-Site Service... Just \$105 Mo!

\$3490

AUSTIN 386/33 UPGRADE OPTIONS

- Upgrade to an Ultra-Fast 175Mb Hard Drive with 32K Cache. \$400
- Additional Floppy Drive. \$79

Want to go incredibly fast? The Austin 386/33 will show you how fast fast can be. With its 4Mb RAM, 125Mb hard drive with 32K cache, and 128K system cache...you'll speed through everything. But don't just take our word. Deskdrive it!



FCC Class B

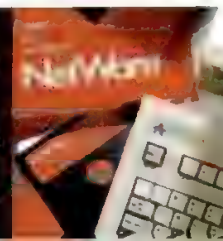
HIGHLIGHTS

- 80386 Intel 32MHz Microprocessor
- 4Mb RAM (Expands to 16Mb with high speed memory slot)
- 128K System Cache
- 125Mb Super-Fast IDE Hard Drive with 32K Cache
- 14" Super VGA Color Monitor with 1024 x 768 Resolution
- Super-Charged VGA Video Adapter with 512K VRAM
- Pre-Loaded with Microsoft Windows 3.0 and MS-DOS 4.01
- Microsoft Mouse
- New Small Footprint Chassis
- Complete System only \$3490!

All Austin WinStation's come fully loaded with our Microsoft Windows Package. You get all the right hardware... plus the new Microsoft Windows 3.0, DOS 4.01, and a Microsoft Mouse.

Networking

Get your business connected in 1991! Austin Computer Systems is an Authorized Worldwide Novell Reseller. Call for details on how to implement a LAN Operating System.



Real power doesn't have to be expensive. The Austin 486/25 proves it with extra high-powered features...like EISA bus architecture, 4Mb RAM, and 125Mb hard drive. And plenty of CAD and fileserver options. All for under \$6000!

Power Up With Austin.

AUSTIN 486/25 WINSTATION

STANDARD FEATURES

- 832-bit EISA/ISA Compatible Slots
- 6 Slots available for Bus Masters
- 4167 Weitek Math Coprocessor Support
- Shadow RAM Caching (BIOS/Video)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- Floppy Drive (1.44Mb or 1.2Mb)
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- RealTime Clock with Battery Backup
- Microsoft Windows 3.0 and MS-DOS
- Microsoft Mouse
- Fully Novell, DOS, OS/2, and Unix Compatible
- EMS LMM 4.0 Support

Complete 1024 x 768 Super VGA Color System with 125Mb Hard Drive, 4Mb RAM and GE On-Site Service... Just \$177 Mo!

\$5890

AUSTIN 486/25 UPGRADE OPTIONS

- Upgrade to an Ultra-Fast 175Mb Hard Drive with 32K Cache. \$400
- Additional Floppy Drive. \$79

HIGHLIGHTS

- i486 Intel 25MHz Processor
- EISA Bus Architecture
- 4Mb RAM (Expands to 64Mb on system board)
- Internal 8K Cache and Floating Point Unit
- Additional 64K External Cache (expands to 256K on system board)
- 125Mb Super-Fast Hard Drive with 32K Cache
- 14" Super VGA Color Monitor with 1024 x 768 Resolution
- Super-Charged VGA Video Adapter with 512K VRAM
- Landmark v1.14 Rating-113.8MHz
- Complete System only \$5890!



Now...all Austin WinStations come with a high resolution 1024 x 768 super VGA color monitor and super-fast adapter card with 512K video RAM.

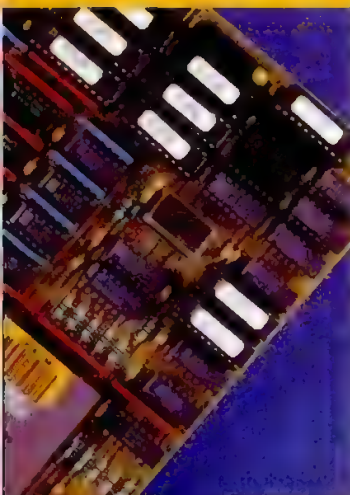
AUSTIN
Has It All!

CALL AND ORDER TODAY

1-800-752-1577



VARS 1-800-338-1569 ■ GSA 1-800-833-4472
New Hours ■ All Time Zones ■ Mon-Fri 7am-7pm ■ Sat 10am-5pm



Each system receives an extensive quality assurance test before it is shipped to you. Our 24-hour burn-in testing includes complete diagnostic testing and individual "hands-on" operation.



Use the Austin Credit Card to get your computer today and pay only low monthly installments. Just call and we'll take your application over the phone.



HIGHLIGHTS

- 80286 16MHz Microprocessor
- 1Mb RAM (expands to 8Mb on system board)
- 40Mb IDE Hard Disk Drive
- Floppy Drive (1.44Mb or 1.2Mb)
- VGA Monochrome Monitor with VGA Video Adapter
- Complete System for only \$1290.

FCC Class B

Why pay over \$400 more for an IBM PS/1 and get less? The Austin 286/16 has more memory, more expansion, more features, and GE on-site service included... for only \$1290! And if this isn't enough, the Austin 286/16 is also 30% faster!

AUSTIN 286/16

STANDARD FEATURES

- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 1 Parallel Port and 2 Serial Ports
- 80287 Math Coprocessor Socket
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Built-in Setup Program
- Compatible with DOS and OS/2
- American-Made Motherboard

Complete VGA System with 1Mb RAM, 40Mb Hard Drive, and GE On-Site Service...

\$1290

Just \$39 Mo!

AUSTIN 286/16 SPECIAL PACKAGE OPTIONS

- Upgrade to VGA Color Monitor \$249
- Upgrade to 2400 Baud Modem \$149
- Microsoft Windows Package—Windows 3.0 and MS-DOS 4.01 Pre-Loaded Plus a Microsoft Mouse \$179

Our Editor's Choice just got better! Now you get all the award-winning features... plus the new Microsoft Windows 3.0, MS-DOS 4.01, and even a Microsoft Mouse. Go with a real winner... the Austin 386/SX16!



HIGHLIGHTS

- 80386SX Intel 16MHz Microprocessor
- 8Mb RAM
- 40Mb IDE Hard Drive
- 14" Super VGA Color Monitor with 1024 x 768 Resolution
- Super-Charged VGA Video Adapter with 512K VRAM
- Pre-Loaded with Microsoft Windows 3.0 and MS-DOS 4.01
- Microsoft Mouse
- Complete System only \$2090!

AUSTIN 386/SX16 WINSTATION

STANDARD FEATURES

- Floppy Drive (1.44Mb or 1.2Mb)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 80387/SX Math Coprocessor Socket
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Compatible with DOS, OS/2, and Unix

Complete 1024 x 768 Super-VGA Color System with 8Mb RAM, 40Mb Hard Drive, and GE On-Site Service Just \$63 Mo!

\$2090

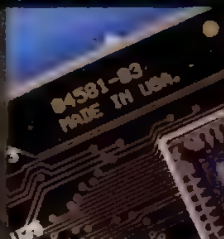
AUSTIN 386/SX16 UPGRADE OPTIONS

- Upgrade to Fast 85Mb Hard Drive with 32K Cache. \$150
- Additional Floppy Drive. \$79

FCC Class B

© 1990 Austin Computer Systems. All Rights Reserved. Other product names or trademarks shown herein are for identification purposes only and may be the property of other companies. Prices and specifications are subject to change without notice. Austin Computer Systems cannot be responsible for errors in typography or photography. There is no stated fee or minimum charge required for the Austin Computer Systems credit card and the annual percentage rate is 17.94% on Texas and 17.99% on all other states.

"Austin Computer Systems is on a roll. The Austin, Texas-based computer seller has garnered PC Magazine Editor's Choices as if the award had been created for it."—PC Magazine, 09/25/90 Issue.



Government & Education 1-800-833-4472

We offer special discounts for government and educational accounts. Have your purchasing agent call our GSA Direct Line toll-free for more information.

Move Up With Austin.

Announcing our new Austin 386/SX20! All the right features...right on the price. You get the new Intel 80386SX 20MHz processor, 2Mb RAM, 85Mb hard drive, Microsoft Windows, and more. It's fast. And it's loaded!

AUSTIN 386/SX20 WINSTATION

STANDARD FEATURES

- Floppy Drive (1.44Mb or 1.2Mb)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 80387/SX Math Coprocessor Socket
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Compatible with DOS, OS/2, and Unix

Complete 1024 x 768
Super VGA Color
System with 2Mb RAM,
85Mb Hard Drive and GE On-Site
Service... Just \$71 Mo!

\$2350

AUSTIN 386/SX20 UPGRADE OPTIONS

- Upgrade to Super-Fast 125Mb Hard Drive with 32K Cache. \$195
- Additional Floppy Drive. \$79

HIGHLIGHTS

- 80386SX Intel 20MHz Microprocessor
- 2Mb RAM
- 85Mb Fast IDE Hard Drive with 32K CacheFlow™ Cache
- 14" Super VGA Color Monitor with 1024 x 768 Resolution
- Super-Charged VGA Video Adapter with 512K VRAM
- Pre-Loaded with Microsoft Windows 3.0 and MS-DOS 4.01
- Microsoft Mouse
- Complete System only \$2350!



FCC Class B

In *PC Magazine's* 386/SX-20 Editor's Choice review, they said, "The Austin 386/SX-20 PowerStation narrowly missed this award (Editor's Choice) because the FCC had not yet granted it Class B status..." Well, guess what! We've got it now!



AUSTIN

Has It All!

CIRCLE 509 ON READER SERVICE CARD

CALL AND
ORDER
TODAY

1-800-752-1577

VARS 1-800-338-1569 • GSA 1-800-833-4472

OVERSEAS (512) 339-3500 • CANADA 1-800-338-1565

New Hours • All Time Zones • Mon-Fri 7am-7pm • Sat 10am-5pm • 10300 Merit Blvd., Austin, TX 78758



VAR

1-800-338-1569

Our Value Added Reseller Program is designed to provide VARs with specific solutions that keep inventory low and profits high.



Every Austin Desktop comes with 1 year of on-site service from GE. That means we'll have someone to your computer site usually within 24 hours! We even offer extended GE contracts for up to five years.

DUSTIN UPGRADES YOU TO BUSINESS CLASS.



ACCOUNTING/FINANCE

ACC PAC BPI	259.
DAC Accounting 4.1	89.
DAC Bonus Pack 4.1	145.
It's Legal	39.
Managing Your Money	135.
Market Analyzer +	265.
Moneycounts	35.
Peachtree III	159.
Peachtree III w/DQ	235.
Quicken 4.0	45.
Rapid Tax	49.
Timeslips III	205.
Turbo Tax	49.

WORKSHEET

Paradox 3.5	529.
Paradox Engine	355.
Paradox Network	699.
Paradox Plus 2	509.
Quattro	89.
Quattro Pro	329.
Reflex	179.
Sidexick +	139.
Sprint	139.
Superkey	75.
Turbo C	75.
Turbo C++	105.
Turbo C++ Pro Pack	209.
Turbo Pascal 6.0	105.
Turbo Pascal Dev Library	265.
Turbo Pascal Pro Pack	209.

BUSINESS GRAPHICS

Applause II	249.
Calendar Creator Plus	45.
Charisma	349.
Dan Bricklins Demo II	159.
Draw Perfect	289.
Easy Flow	109.
Flowcharting III	149.
Form Filler	89.
Form Publisher Windows	145.
Form Tool Gold	65.
Freelance Plus	339.
GB Executive	159.
Harvard Graphics	319.
Hijaak	115.
Hotshot Graphics	149.
Impress	85.
Inset + Hijaak	139.
Jetform Design	289.
ORG Plus Advanced	75.
Perform	109.
Perform Professional	289.
Presentation Team	349.
Storyboard Plus	265.

EDUCATION

3D Drafting	219.
Autosketch 3.0	159.
Generic CADD 5.0	249.
Design CAD	159.
Design CAD 3D	209.
Drafix For Windows	449.
Drafix Ultra	259.

COMMUNICATION

Carbon Copy +	125.
Carbon Copy + Host	209.
CO Session	139.
Crosstalk Communicator	39.
Crosstalk Mk IV	149.
Crosstalk Windows	129.
Crosstalk XVI	119.
Laplink III	99.
PC Anywhere III	69.
PC Anywhere IV	109.
Procomm Plus	75.
Smartcom III	149.
Smartterm 240	205.
Smartterm 320	119.
Softterm PC	135.
Take Over	175.

DATABASE

ACT	235.
-----	------

AskSam

Elanion Personal	179.
Elanion Professional	495.
Cliptop 5.0	339.
Data Perfect	289.
DBase IV	519.
DBase IV Developers	865.
DBase IV Lan	659.
DBXL	149.
Finbase +	209.
Foxbase + Lan	309.
Foxbase + Lan	359.
Foxbase + Runtime	259.
Foxpro	479.
Foxpro Lan	659.
Foxpro Runtime	309.
Paradox Engine	355.
PC File 5.0	95.
Q & A	245.
Quicksilver	349.
Rapidfile	105.
R Base 3.1	309.
R Base Personal	89.
SCO Foxbase + 286	725.
SCO Foxbase + 386	725.
SQL Windows	899.
Superbase 2	219.
Superbase 4 Windows	449.

DESKTOP PUBLISHING

25 In One	289.
Artline 2.0	419.
Catchword	149.
Corel Draw 2.0	399.
Designer	489.
Desktop Publisher	179.
Draw Plus	215.
Express Publisher	99.
First Publisher	109.
Fontasy III	49.
Freedom Of The Press	259.
Go Script Plus	199.
Graphics Composer	269.
Graphics Editor	449.
Grasp	125.
Headlines In A Cartridge	219.
Jetpage	349.
OmniPage 386	619.
Pacific Page	389.
Pacific Page Personal	389.
Pagemaker	529.
Pagemaker Mac	539.
PC Paintbrush IV +	119.
Pizzazz +	75.
Printmaster Plus	42.
Printshop	45.
Publish It 1.2	149.
Publishers Type Foundry	319.
Readright	319.
Readright Personal	169.
Readright Windows	325.
Show Partner F/X	235.
Soft Type	119.
Superset +	299.
The Animator	249.
Ultra Script PC Plus	265.
Ventura Gold	569.

EDUCATION TRAINING

Teach Yourself	
Windows 3.0	35.
Where Is Carmen?	35.
Learning German	85.
Learning Spanish	85.
Learning DOS	45.
PC Bible Study	89.

INFORMATION/PROJECT

MANAGEMENT	
Agenda 2.0	309.
Current	239.
Grandview	209.
Harvard Project	
Manager	449.
Idea Fisher	409.

MaxThink	49.
Project Scheduler IV	289.
Professional Plan	79.
Super Project Expert	485.
Timeline 4.0	449.
Who-What-When	479.
WP Office 5 User	185.
WP Office 5 User	335.
WP Office 5 User	89.

INTERVIEW

First Choice	119.
Flamework III	469.
Lotus Works	99.
MS Works	109.
Open Access III	409.
Smartware II	469.
Smart System Xenix	899.
Symphony 2.2	529.

MATHEMATICAL

Derive	129.
Mathematica 386	599.
Mathcad	329.
SPSS/PC +	569.
Statgraphics	575.
Grapher	149.
Sigma Plot	489.
Plot It	345.

MISCELLANEOUS

MS Basic	349.
MS C Compiler	349.
MS Chart	285.
MS Dos 3.3	79.
MS Dos 4.01	79.
MS Excel	329.
MS Flight Simulator	45.
MS Fortran	319.
MS Macro Assembler	109.
MS Mouse with Paint	109.
MS Mouse with Windows	169.
MS Multiplan	139.
MS Project	349.
MS Project Windows	499.
MS Quick Basic	75.
MS Quick C	75.
MS Windows 3.0	99.
MS Windows Dev	
Toolkit	345.
MS Word 5.5	239.
MS Word Windows	339.

OPERATING SYSTEMS

Concurrent DOS 386	295.
MS DOS 3.3	79.
MS DOS 4.01	79.
Novell (all products)	Call
OS/2 Pres Mgr Toolkit	359.
OS/2 Standard	319.
PC DOS 3.3	135.
PC DOS 4.01	135.
PC MOS 5 User	449.
SCO VP/IX	365.
Unix 386 Development	725.
Unix 386 Operating	659.
VM 386	145.
VM 386 Multi User	575.
Xenix 286 Operating	509.
Xenix 386 Operating	659.

PROGRAMMING

Actor	829.
APL Plus	459.
Brief	159.
Case PM	1499.
Clear + For C	139.
Halo 88	269.
Owl Guide	399.
RM Cobol 85	799.
Smalltalk V286	129.
Smalltalk VPM	299.
Toolbook Windows	309.
Turbo C Tools	109.
Turbo Professional	105.

UI Programmer

	365.
--	------

SPREADSHEETS

Excel	329.
Lotus 123 ver. 2.2	339.
Lotus 123 ver. 3.1	419.
Lotus Upgrade	139.
Quattro	89.
Quattro Pro	329.
Quattro Pro Upgrade	95.
SCO Professional	579.
Supercalc V	319.
Wingz PC	339.

UTILITIES

386 Max 5.1	79.
Above Disk	69.
Allways	119.
Auto Menu	45.
Baler	359.
Check It	95.
Control Room	75.
Copy II Option Board	119.
Copywrite	65.
CP Back-Up	75.
Cubit	45.
Desqview	79.
Desqview 386	129.
Direct Access	69.
Disk Manager	45.
Disk Technician Gold	109.
DS Back-Up	49.
Fast	69.
Fastback Plus	119.
First Apps	59.
Impress	85.
Info Select	69.
Intelligent Back-Up	89.
K Edit	109.
Mace 1990	95.
Magellan	115.
MKS Toolkit	225.
Norton Utilities 5.0	119.
Norton Back-Up	109.
Norton Commander	109.
Norton Editor	59.
P Link 86	289.
PC Kwik Powerpack	79.
PC Tools 6.0	89.
PK Zip	45.
Pop Drop Plus	65.
Print A Plot	189.
Print Cache	105.
Print Q	85.
Q Dos II	42.
QEMM 386	62.
QRAM	55.
Scrapbook Plus	109.
Sideways	49.
Software Bridge	79.
SPF/PC	165.
Spinrite 2	69.
Switch It	69.
Turbo EMS	59.
Windows Express	59.
Wonder Plus	55.
X Tree Net	169.
X Tree Pro Gold	89.
@ Liberty	179.

WORD PROCESSING

AMI Professional	319.
CHI Writer Deluxe	255.
Grammatik IV	55.
Language Master	65.
Manuscript	345.
Multimate 4.0	259.
Nota Bene	339.
Professional Write	169.
Rightwriter 4.0	65.
Word For Word Pro	89.
Wordperfect 5.1	259.
Wordperfect Add On	169.
Wordstar 2000 +	339.
Wordstar 6.0	289.

Buying software is a lot like traveling by airplane. The important thing is not only what you buy, or where you go, but how you're treated along the way. Many companies will give you premium service only for a premium price, while others offer a no-frills price that usually results in a no-thrills experience. Either way, you shouldn't have to choose between service and savings.

At Dustin Discount Software, we offer you much more than a wing and a prayer.

Like all the latest titles for your PC. Full manufacturers' warranties. Free ground shipping. No minimum orders. And, best of all, extremely low prices.

As one of the largest IBM software dealers in the world, we at Dustin Discount Software are dedicated to providing all of our customers with premium service at the lowest available price. And with thousands of software items in stock, we back up our commitment to our customers by offering a tremendous selection.

So, if you're ready to be upgraded to business class service, call Dustin Discount Software.

And get ready to take off.

THE DUSTIN DIFFERENCE:

- ✓ Free Ground Shipping
- ✓ Same Day Shipping
- ✓ Overnight Delivery Available
- ✓ Corporate PO's Welcome
- ✓ APO's & FPO's Welcome
- ✓ Government & Educational Pricing
- ✓ No Minimum Orders
- ✓ Visa, MasterCard, & AMEX Accepted
- ✓ No Credit Card Charges Until Shipping
- ✓ No Credit Card Surcharges
- ✓ Thousands of Items in Stock
- ✓ The Latest Software Versions for your PC
- ✓ Manufacturers' Warranties & Documentation
- ✓ Call for Items Not Listed & Free Catalogue



Plain Wrap Prices,
Black Tie Service.

To order, call us Toll-Free
from anywhere in the United States.

1-800-274-6611

And while you're on the phone,
ask us for a Free Dustin catalogue.

We will promptly replace any defective items, but cannot guarantee compatibility. There is a 15% restocking fee on any non-defective, unopened goods, and all returns must be accompanied by a Returned Merchandise Authorization. Software prices do sometimes fluctuate beyond our control and may change, for better or worse, without notice. While ground shipments are free, we do ask \$11.00 per item for 2-day, \$22.00 per item for overnight, and \$4.50 for C.O.D. Although shipping heavier items may be slightly more, bulk orders can be a lot less. Free catalogues are available upon request, and please call us for any item not listed. Dustin Discount Software is open Monday thru Friday from 7:00 AM to 5:00 PM PST. We are located at: 20969 Ventura Blvd., Suite 13, Woodland Hills, CA 91364. Tel: 818-710-9174 FAX: 818-884-5310

CIRCLE 347 ON READER SERVICE CARD

Letters

THROUGH THE FOREST OF PCS

Through your reviews such as "20-MHz 386SXs: The New Entry-Level Machines" (November 27, 1990), you have always been valuable in helping to differentiate among the various trees in the forest of PCs. But I must question the value of the individual photographs that accompanied each review. What message were you trying to convey?

In each case, the largest part of the frame consisted of the requisite PC Labs screen, which may be seen in color on the issue's cover, as well as a smaller copy on the lead page of the article. What remained of the frame was given to a corner of the machine proper and a slice of keyboard.

What the photographs *do not* convey are such things as the aesthetics of the cabinetry, where and which controls are placed in front, and so forth. Nor can you tell which variation of keyboard layout is being used.

May I suggest that either the art director back up a bit, or that you leave the monitor out of the photo especially if it is a third-party monitor.

While a botanist may appreciate a photograph of a section of bark and a leaf, I would prefer to see the whole tree, at least once.

Bruce J. Preston
Ridgefield, Connecticut

MEMO TO WILL

Would someone please tell Will Zachmann to stop trying to sell us so hard on OS/2? Gee!

Joe Greene
Indianapolis, Indiana

MORE TO SAY ABOUT GATEWAY

Gateway 2000's pricing policy is strange indeed (Letters, November 27, 1990). But so is its advertising. Biweekly, Gateway inserts five thick, glossy sheets of noninformative material in your magazine. I would estimate that within the last two months alone, Gateway must have



PC Magazine: Can't see the tree for the leaves?

used about 100 tons (yes, tons) of heavy-weight, high-quality paper this way.

Like others, I read your magazine partly for its advertising. But by displaying such wasteful disregard for our natural resources, Gateway lost me as a potential customer quite a long time ago.

W. Peter Janicki
Bethesda, Maryland

I think you gave Gateway 2000 a bum rap in the November 27 Letters column. If you read Lance Simmons' letter, and then read Todd Osborne's reply, you get two different versions of the story. Lance says "the price given in the review was lowered just so the system could appear in the article," while Todd says "The \$1,850 system was configured to *PC Magazine's* review parameters."

These tell the same story but imply vastly different things. Your emphasis of the "dung from the cows" statement in the column's call-out box leaves the casual observer with the impression that Gateway 2000 is a bunch of stinkers (no pun intended).

Whatever happened is not the issue. I

and several of my associates own Gateway machines, and I have bought more than 20 Gateway machines for my office. I find that Gateway provides the best equipment at the lowest price, and the service has been excellent.

Chuck Minnich
Albany, Georgia

It was with concern that I read about the problems your other readers had with Gateway 2000 (Letters, November 27, 1990). This was *not* my experience with Gateway.

I ordered a system from the company and have been satisfied with the level and quality of service I have received both from Gateway's sales department and from the tech department. I can only assume that your other readers might have dealt either with a new salesperson or one not as helpful and knowledgeable as the one who dealt with me.

It sounds like Gateway needs to train its salespeople to handle calls from prospective customers more effectively.

Stephen P. Havasy
Port Washington, New York

WINDOWS: A SHORT-TERM SOLUTION

Charles Petzold's "Computing in the 1990s: Why Windows 3.0 Is Only a Short-term Solution" (Environments, November 27, 1990) should be required reading for every PC manager who is swallowing Microsoft's multimillion-dollar hype about Windows 3.0.

While he mentioned that all calls to DOS involve switching from protected to real mode and back, he noted only that this has system-stability implications. He could also have noted that it has horrendous performance implications. My tests indicate that a heavily I/O-bound program runs at roughly one-fourth the speed in Windows standard mode (versus real mode). The trade press seems bent on defining performance as screen-switching speed. Rating Windows 3.0's performance

BeckerTools

File and data management utilities for Windows 3.0

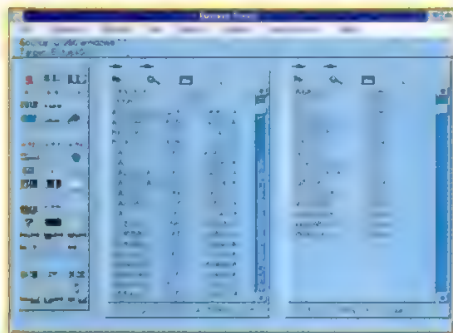


With dozens of even more powerful features

BeckerTools is a high performance replacement for the File Manager and features dozens of additional file and data management utilities.

BeckerTools features include:

- ▶ Launching Applications - launch applications directly.
- ▶ User Levels - 3 levels: beginning, intermediate and advanced.
- ▶ Undelete Directories - undelete directories in addition to individual files.
- ▶ File Grouping - perform operations on files as a group.
- ▶ File Packing - savings of 50% to 85% disk space.
- ▶ Disk Formatting - improved disk formatting speed.
- ▶ File Editing - new hex editor to edit virtually any type of file.
- ▶ Create bootable disks - now you can create your own bootable system disks.
- ▶ Reliability Checking - check for physical errors on your disk media.
- ▶ Undelete - recover deleted files
- ▶ Delete files - single, groups of files or directories, including read-only files
- ▶ Duplicate diskettes - read diskette once, make multiple copies
- ▶ Edit text - built-in editor with search and replace
- ▶ Backup (pack files) hard disk - to multiple diskettes - with password protection
- ▶ Format diskettes - in any capacity supported by your drive and disk type
- ▶ Wipe diskette - for maximum security
- ▶ Copy diskettes - in single pass
- ▶ Screen blanker - prevent CRT "burnout"
- ▶ Many other useful utilities.



System requirements:

- IBM AT, 386 or 100% compatible computer
- Hard disk and Windows 3.0
- Windows not included
- Includes both 5.25" and 3.5" diskettes



Suggested retail price: \$129.95

In US and Canada add \$4.00 shipping and handling. Foreign orders add \$12.00 postage per item.

Order Toll Free
1-800-451-4319 Ext. 132

Available through Radio Shack's Express Order Service, Wadsworth Software, Software Etc. and other retailers nationwide. Or order direct from Abacus using your Visa, MasterCard or American Express credit card.

Abacus

Dept. M22 • 5370 52nd Street SE • Grand Rapids, MI 49512
Phone: (616) 698-0330 • Fax: (616) 698-0325

CIRCLE 172 ON READER SERVICE CARD

Letters

on this basis alone is tantamount to fraud.

Given more space, I'm certain Mr. Petzold would have covered other problems that are encountered when an attempt is made to superimpose a multi-tasking, protected-mode, graphics environment on top of a single-tasking, real-mode, outdated operating system. Had he done so, you might have titled the article "Why Windows Is No Solution."

Wayne Johnson
Becker, Minnesota

STREET PRICE APOLOGY

I read with some amusement John Dvorak's comments regarding "Street Price Apology" (Inside Track, November 13, 1990). Unfortunately, *PC Magazine* is one of the worst promoters of this mentality (where a company creates an unrealistically high list price on a product that is then discounted on the street so that consumers think they're getting a real bargain).

In the same issue, you publish what you have decided should be the "street price" on laser printers. This can only add to the problems faced by retailers and VARs who try to provide a value to their customers.

Put the shoe on the other foot, *PC Magazine*. Great publication: List price \$2.95, should sell on the street for about a buck and a half!

Thomas J. Plunkett
Redmond, Washington

UPGRADING YOUR 286

In regard to your reply to Mr. Truluck (Letters, November 13, 1990) concerning upgrading his 286, I must disagree. I am an experienced computer hobbyist who has assembled and upgraded many systems for myself, for businesses, and for friends. In my opinion, accelerator boards are overpriced, mediocre in performance, and waste a valuable bus slot.

Why pay \$300 to \$400 for a questionable improvement when a high-quality 386SX main board can be had for as much or less? The memory must be upgraded as well, but most 286 owners only have 1MB anyway. At \$50 per megabyte, this is the best time in the history of PCs to buy memory.

Owners of 286s who are stuck with an extra memory card can easily use it as a

RAM disk in their new 386. Some accelerator boards require an expensive extra daughtercard for fast memory anyway. In certain cases you can actually save money by replacing the systemboard.

Clever as some accelerator board designs may be, I would never recommend one to a client or friend. It's just a matter of choosing efficient and appropriate tech-

Thanks for making
PC Magazine less
difficult to lose by
providing the rose
bouquet tracking scent.

nology and keeping a clear conscience.

Bill Copenhagen
Richmond, California

THE PEOPLE HAVE SPOKEN

Thanks for another great printer issue (November 13, 1990). And thanks for making this issue less difficult to lose by providing the easy-to-locate rose bouquet tracking scent.

Bruce Vieser
Knoxville, Tennessee

How do I go about getting unscented issues of *PC Magazine*? I'm referring to the December 11, 1990 issue which contained some kind of ad with pictures of a rose and an accompanying scent. I can't tell you who placed the ad, because I was busy tossing the ripped out pages in the trash and running for my allergy pills.

PC Magazine is a great source of information. Can't we get the information without the perfumes? I thought blow-in cards were a pain. They pale by comparison.

Richard Doig
Orion, Michigan



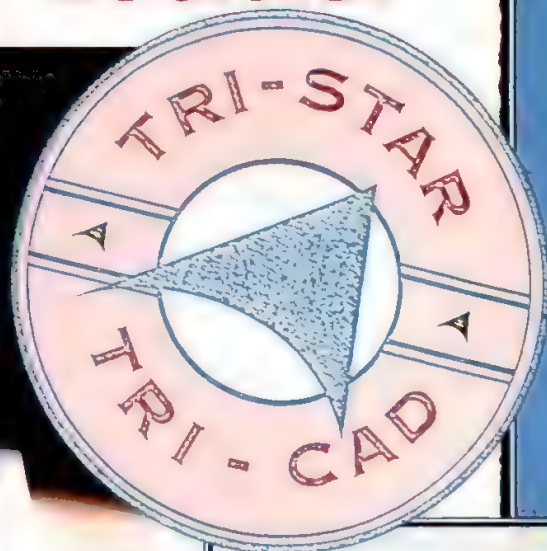
We received a flood of letters about that ad, and it has been pulled from our magazine. Thanks go to all of you who made your opinions known to us.—Ed.

WINDOWS UTILITIES

Regarding Barry Simon's First Look at "Aporia's Object-Oriented Desktop" (First Looks, November 27, 1990): The implication of Simon's evaluation is that Apo-

THE RIGHT DECISION

Student Body Leader



ADVANCED FEATURES INCLUDE:

- Intel 80486 Processor
- Integrated Math Coprocessor
- 8MB High Speed DRAM
- 64K Static RAM Cache
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- 200 MB Fast Access Hard Drive
- SVGA Adapter w/1MB DRAM
- 16" 1024 x 768 Color Monitor
- Microsoft DOS 3.0 or 4.01
- 2 Serial & 1 Parallel Ports
- 12"x12" Digitizer w/Cursor
- 101-Key Enhanced Keyboard

Tri-CAD workstations are the hands-down choice of the world's leading CAD training schools and Universities. Schools such as the University of Texas and the world's largest CAD training center – The CAD Institute, insist on Tri-CAD quality.

We designed the Tri-CAD family with one goal – to build the best CAD workstations available anywhere, at any price.

Tri-CAD systems from Tri-Star outperform machines costing three times as much. And our standards of quality, reliability, service, and support are consistently acclaimed one of the highest in the industry. Tri-CAD has a CAD workstation for every level of expertise, each including everything you need to be productive with today's leading CAD software packages.

TRI-CAD WORKSTATIONS

EXPERT
486/25
\$5195

ULTRA
486/33
\$5895

UPGRADES:

486 EISA CALL
RENDITION II/256V \$695
20" COLOR MONITOR \$995
12"x17" DIGITIZER \$245

ALL TRI-CAD COMPUTER SYSTEMS INCLUDE:

- 60 Day Money Back Guarantee
- 2 Year Warranty Parts & Labor
- 12 Month On Site Service
- Air Express Parts Replacement
- Lifetime Toll-Free Technical Support

All prices and specifications subject to change without notice. We accept MasterCard & Visa (No Surcharge). AMEX: 3% Surcharge; no E.O.D. University & Corporate PCs are welcome. (1%10 Net 25) Money Back guarantee does not include shipping charges. On Site service available in most U.S. locations. 2 Year Warranty includes system and keyboard. (See Tri-Star assembly items such as printers, digitizers and monitors are covered for 1 year. All systems have been verified or certified to comply with part 15 of the FCC rules for a Class A or Class B computing device.

TRI-STAR
COMPUTER CORPORATION

1.800.678-2799

707 West Geneva, Tempe, Arizona 85282

Tech Support 1.800.688-TECH

Telephone 602.829-0584

Fax 602.345-0110

Monday - Friday 7:00am-7:00pm MST

Saturday 9:00am-4:00pm MST

With Windows, the With our Windows



future takes shape. applications, it soars.



This year, Microsoft® Windows™ version 3.0 lifted personal computing to new heights.

But to see how far Windows can really take you, you'll need Microsoft Windows applications. A superior group of applications specifically designed to get the most out of the Windows environment.

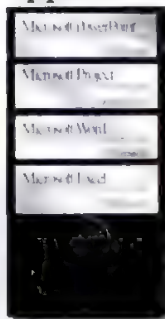


Only Microsoft now offers a family of mainstream Windows applications for business.

Because they work just like the Windows environment, they'll dramatically shorten your learning curve.

Another advantage: there is no difference between what you'll see on-screen and what prints. So feel free to experiment with different font styles. And sizes. And formats.

Then try cutting and pasting. Since our applications work together, moving text, data, graphics or anything else from one to another is a snap.

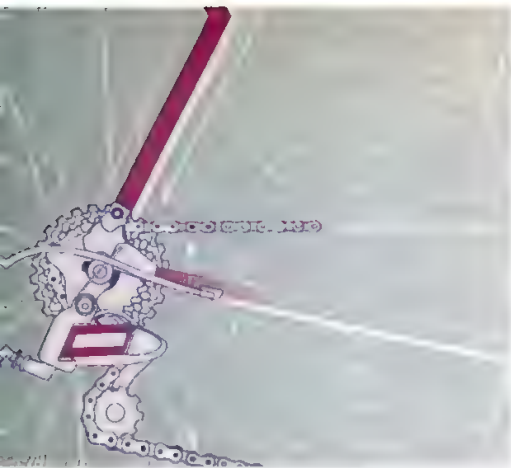


Windows applications also read files from the software you're already using. Making the switch to Windows computing even easier.

To see for yourself, simply stop by the software dealer nearest you. Or give Microsoft a call at (800) 541-1261, Department N23.

Before long, you will see just how simple it can be to get your best ideas off the ground.

Microsoft
Making it all make sense®



Mental Pictures Developed Here.

No matter what you have in mind, Micrografx Designer 3.0 gives you the power to develop it. Your creativity will thrive because you'll be drawing on the most sophisticated set of design tools available.

Designer 3.0 allows you to explore multiple directions quickly and easily. From technical drawings and commercial design to organization charts and illustrations, your thoughts can be realized with unsurpassed precision and enhanced visual control.

And while you've been honing your design skills, we've been improving our program. Besides an impressive array of features that *PC Week* describes as "a complete graphics art studio," here are a few new ways we'll be keeping the competition deep in thought:

 Import and autotrace any bitmap image, instantly converting it to a crisp vector-based drawing. Autotrace will even match color. You can now edit and create a new vector-based color illustration in minutes.

K Designer now comes with over 40 industry-standard outline typefaces, and supports hundreds more from Bitstream and URW. Any typeface can be entered and manipulated on-screen to create custom headlines and logos.

 Designer sets a new standard in Bezier curve editing technology. From fast manipulation of objects using the reshape points tool to the advanced reshape Bezier tool for greater control of complex curves.

 Layers are perfect for engineers and architects who need overlays in their drawings. View only the layers you're working on minimizing redraw time while maximizing drawing speed and visual focus.

 Designer lets you turn anything on the screen into a fill pattern. Type, imported graphics, and graphics you've created. All can become custom fills, enriching your design with dynamic patterns and textures.

 Designer 3.0 includes a complete selection of import and export formats so you can easily start sharing graphics right away.

 Designer's maximum page size is 132" x 132". For precision drawing, you can set snap grids and rulers as small as 1/99th of an inch. The zoom tool allows you to magnify your drawing to 1"x1" for exacting detail work.

 Using TeleGrafx, Designer can send your files via modem to outside service bureaus for instant slide processing. Or you can create an on-screen presentation using SlideShow, which has over 20 transitional effects. A high-impact way of getting your thoughts across. Both come free with Designer 3.0.

Being the leader in Windows-based graphics applications is a continuing process of innovation and research. At Micrografx, we've succeeded because we've also learned to listen to the people who use our products. We hope you enjoy the new Designer 3.0.

Getting acquainted with Designer is easy. Ask for it at your local software dealer or through your corporate purchasing department. Or, call Micrografx directly at 1-800-733-3729, extension 5050 (U.S.), or 3710 (Canada) for more information.

Designer[™]
version 3.0

M I C R O G R A F X

Letters

ria is just a little bit strange, which it is. And then he concludes, "It's the most intriguing, innovative, exciting, and promising Windows shell I've seen."

Simon must lead a sheltered life. He should see—everyone should see—*Command Post*, Version 70J, by Wilson WindowWare. You gave *Command Post* a brief nod in June, I believe, after the release of *Windows 3.0*. It was in transition then and deserves a closer look now. Those who look will be impressed.

Robert W. Edkin
New York, New York

PC What a coincidence. This issue we took a comprehensive look at *both* programs, as well as other *Windows* utilities.—Ed.

LET THE END USERS WAIT

Many times you cover software usage issues: copy protection, legal usage, and so on. Here's an issue rarely mentioned: When an upgrade is announced for a new release, many advertising dollars are spent by the manufacturer both to announce the new version and to generate new sales. This is as it should be, but shipping the upgrade for current users is often held until last. The company's first objective is always to get the product on the shelves to cover the business user base—where the money is.

Currently, I have been waiting almost two months for an upgrade to a major graphics program. Although I have been placed in the "Rush" arena (after two calls), I am told it will still be about three more weeks before shipment, as the company is under contract to a distributor who must come first. I have also experienced similar delays for other upgrades.

I believe it's time for the software industry to take care of its current end users first, not rely on new sales it may or may not generate from advertising dollars.

Gary P. Younkins
Albuquerque, New Mexico

FAX LINE MANAGERS

In your article "Fax Line Managers: The Electronic Call Director," (December 11, 1990), two primary solutions for voice/data switching were discussed (answering on the first ring and waiting until the call is answered). Both solutions are very

important, depending on whether the switch is installed in a home or office. I had hoped the article would have emphasized that Technology Concept's Fax Line Manager is the only product reviewed that has both modems in one switch. The benefit of this integration is that a single product can be easily installed in a home or small business.

Modem usage is important to your readers, as well. Technology Concept's Fax Line Manager 202 has the DataDetect option for fax and modem sharing. This feature allows a fax and a modem to coexist on a single phone line without any manual caller intervention.

Jim Sturtevant
President, Technology Concepts
Foster City, California

COPY PROTECTION WOES

John Dvorak is right to be outraged at Lotus Development's protectionist moves (November 13, 1990). But the days of programmers turning out code for the public good are long gone. Software is a multibillion dollar industry, and it is no surprise that it is dominated by marketing-oriented companies that would be just as happy selling soap powder as they are selling programs. In such a world, Lotus's actions are, sadly, logical.

It's a tragedy that these corporations have forgotten their roots. Okay, so nobody expects altruism from IBM, but can Bill Gates, for example, really be proud of the way Microsoft has turned out? Sure, it makes vast profits, but at the expense of an alienated user base locked into underdeveloped products with worthless support (at least here in Britain). It almost makes you nostalgic for CP/M.

Nigel Thomas
London, England

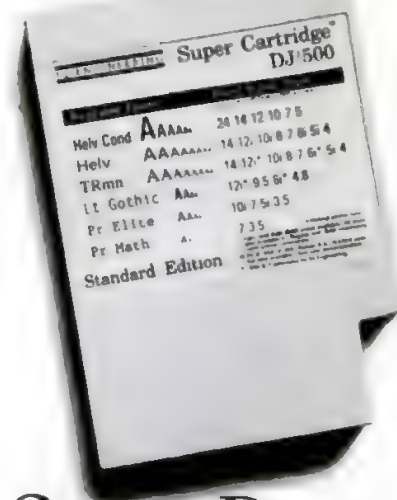
CORRECTIONS & AMPLIFICATIONS

Instant-Office from Dilworth Software ("Total Recall," December 25, 1990) has the ability to import *WordPerfect* files and includes a cut-and-paste feature.

HOW TO WRITE TO PC MAGAZINE

Please send letters to *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see the "By Modem" sidebar in Utilities for access information). All letters become the property of *PC Magazine* and are subject to editing. ■

SUPER CARTRIDGE.



SUPER DEAL.

Here's a super value for you: IQ Engineering's new Super Cartridge™ DJ/500 is packed with more fonts, more sizes and more symbols than other leading HP DeskJet® font cartridges. Yet it costs 20% less!

The Standard Edition supports more than 2,000 fonts and symbol sets when used with your HP DeskJet 500 printer—including international symbols in 30 languages. Based on six popular type families, it contains fonts from 4 to 24 points, and is compatible with all major software applications. This could easily be the only font cartridge you'll ever need.

But if you do need more, go Professional. The Professional Edition features the Standard Edition cartridge plus a headline cartridge with 11-point type to 30-point type for presentations and desktop publishing. And both Super Cartridges are also available for HP DeskJet Plus users, too.

The new Super Cartridge DJ/500 from IQ Engineering. It's more cartridge than you could ever imagine. For less cash than you'd ever expect.

For the Super Cartridge dealer nearest you call 1-800-765-FONT. In Canada 800-663-6157.

Super Cartridges For HP LaserJet Printers Are Also Available.

Super Cartridge™

IQ ENGINEERING

685 N. Pastoria Ave., Sunnyvale, CA 94086
Super Cartridge and IQ Engineering are trademarks of IQ Engineering.
DeskJet and LaserJet are registered trademarks of Hewlett-Packard Company. © 1991 IQ Engineering. All rights reserved.

Complete Systems... No U

Complete Systems Philosophy

MicroLab computers are renowned for their industry leading technology, performance and pricing.

We only sell complete systems. Monitors and hard disks are standard in every one.

Look closely. Some ads boast low cost "base" units primarily to attract your initial interest. Known as fly paper advertising, they serve only as a price starting point, often requiring a floppy disk or monitor to become a truly complete, functional system.

MicroLab customers are smart. They demand a bargain and a complete solution.

Plus they avoid sticky situations.

Custom System Configurations

Along the same lines, we realize that not every customer will want a fully loaded system. Least wise, not

the exact way we've configured it.

That's where our highly trained Systems Consultants come in.

Tell them you want a modem or tape back up installed off the bat and they'll lay out all your options.

Tell them you're a student on a budget and they'll help you configure a system that will economically suit your current needs while providing for future expansion.

Tell them you're really into CAD or Desktop Publishing and they'll drive home your many CPU, video, graphics controller and co-processor options.

Go ahead. Ask them. They especially love this part of their job.

Consistently Superior Quality

Each MicroLab system is hand assembled and put through a 72-hour battery of stringently administered

diagnostic tests. All to assure "bugs free" operation prior to shipment.

Your system is made in the U.S.A. and is shipped straight to you.

Fast. Direct. No middlemen.

And only the finest name brand, state-of-the-art components are used in each system we build.

No old technology or off-brand, low cost "box stuffers" used here.

That's a promise. And a commitment!

Attention to Detail

At MicroLab, we believe your system should look as good as it performs. So it's no wonder our customers applaud the unique, trendsetting two-tone styling of our system cabinetry.

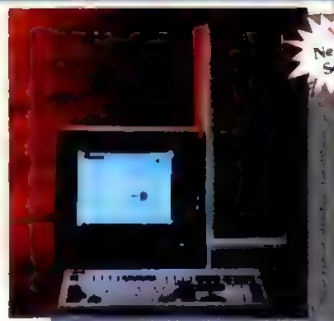
MICROLAB™ 486/25



Next Day Service!

- 4MB RAM-expandable to 16 MB
- Intel Co-Processor On Board
- 1.2MB 5.25" Floppy Disk Drive
- 1.44MB 3.5" Floppy Disk Drive
- 160MB Hard Disk Drive
- High Speed 1:1 Interleave
- Hard/Floppy Disk Drive Controller
- 14" Super VGA 1024x768 Monitor
- 16 Bit VGA Adaptor with 512K
- 2 Serial, 1 Parallel & 1 Game Port
- 101 Key Tactile Switch Keyboard
- MS DOS 3.3 or 4.01

MICROLAB™ 386 Cache/25 & 386 Cache/33



Next Day Service!

- 4MB RAM-expandable to 8 MB
- 64KB Cache RAM On Board
- 1.2MB 5.25" Floppy Disk Drive
- 1.44MB 3.5" Floppy Disk Drive
- 120MB Hard Disk Drive
- High Speed 1:1 Interleave
- Hard/Floppy Disk Drive Controller
- 14" Super VGA 1024x768 Monitor
- 16 Bit VGA Adaptor with 512K
- 2 Serial, 1 Parallel & 1 Game Port
- 101 Key Tactile Switch Keyboard
- MS DOS 3.3 or 4.01

MICROLAB™ 386/25



Next Day Service!

- 2MB RAM-expandable to 8 MB
- 1.2MB 5.25" Floppy Disk Drive
- 1.44MB 3.5" Floppy Disk Drive
- 80MB Hard Disk Drive
- High Speed 1:1 Interleave
- Hard/Floppy Disk Drive Controller
- 14" Super VGA 1024x768 Monitor
- 16 Bit VGA Adaptor with 512K
- 2 Serial, 1 Parallel & 1 Game Port
- 101 Key Tactile Switch Keyboard
- MS DOS 3.3 or 4.01

Complete Super VGA 160MB System \$5195

Video Options — Include Monitor & Video Card							
MICROLAB 486 25 Price Matrix	Mono Chrome 12"	Mono Flat 14"	CGA Color 14"	EGA Color 14"	VGA Color 14"	VGA Multi 14"	VGA Hi-Res 14"
30MB 1:1 Interleave	\$2745	\$2795	\$3095	\$4045	\$4095	\$4145	\$4245
40MB 1:1 Interleave	\$2795	\$2845	\$3145	\$4095	\$4145	\$4195	\$4295
60MB 1:1 Interleave	\$2895	\$2945	\$3245	\$4195	\$4245	\$4295	\$4395
80MB 1:1 Interleave	\$2995	\$3045	\$3345	\$4295	\$4345	\$4395	\$4495
120MB 1:1 Interleave	\$4295	\$4345	\$4645	\$4595	\$4645	\$4695	\$4795
160MB 1:1 Interleave	\$4895	\$4945	\$5245	\$5195	\$5245	\$5295	\$5395
320MB 1:1 Interleave	\$5295	\$5345	\$5645	\$5595	\$5645	\$5695	\$5795

Makes a great LAN Server or Multi-Tasking Workstation!

• Optional case styles available • FREE MS DOS 3.3 or 4.01

MS-DOS®, UNIX®, OS/2® & Novell® Compatible
Landmark: 114.1 - Norton: 38.8

Complete Super VGA 120MB System \$3245*

Video Options — Include Monitor & Video Card							
MICROLAB 386 Cache-25 Price Matrix	Mono Chrome 12"	Mono Flat 14"	CGA Color 14"	EGA Color 14"	VGA Color 14"	VGA Multi 14"	VGA Hi-Res 14"
30MB 1:1 Interleave	\$2195	\$2245	\$2345	\$2495	\$2545	\$2595	\$2695
40MB 1:1 Interleave	\$2245	\$2295	\$2395	\$2545	\$2595	\$2645	\$2745
60MB 1:1 Interleave	\$2345	\$2395	\$2495	\$2645	\$2695	\$2745	\$2845
80MB 1:1 Interleave	\$2445	\$2495	\$2595	\$2745	\$2795	\$2845	\$2945
120MB 1:1 Interleave	\$2745	\$2795	\$2895	\$3045	\$3095	\$3145	\$3245
160MB 1:1 Interleave	\$3145	\$3195	\$3295	\$3445	\$3495	\$3545	\$3645
320MB 1:1 Interleave	\$3245	\$3295	\$3395	\$3545	\$3595	\$3645	\$3745

Makes an ideal CAD Workstation!

• Optional case styles available • FREE MS DOS 3.3 or 4.01

MS-DOS®, UNIX®, OS/2® & Novell® Compatible
Landmark: 40.5, 53.5 - Norton: 29.3, 38.2

Complete Super VGA 80MB System \$2645

Video Options — Include Monitor & Video Card							
MICROLAB 386 25 Price Matrix	Mono Chrome 12"	Mono Flat 14"	CGA Color 14"	EGA Color 14"	VGA Color 14"	VGA Multi 14"	VGA Hi-Res 14"
30MB 1:1 Interleave	\$1895	\$1945	\$2045	\$2195	\$2245	\$2295	\$2395
40MB 1:1 Interleave	\$1945	\$1995	\$2095	\$2245	\$2295	\$2345	\$2445
60MB 1:1 Interleave	\$2045	\$2095	\$2195	\$2345	\$2395	\$2445	\$2545
80MB 1:1 Interleave	\$2145	\$2195	\$2295	\$2445	\$2495	\$2545	\$2645
120MB 1:1 Interleave	\$2245	\$2295	\$2395	\$2545	\$2595	\$2645	\$2745
160MB 1:1 Interleave	\$2345	\$2395	\$2495	\$2645	\$2695	\$2745	\$2845
320MB 1:1 Interleave	\$2445	\$2495	\$2595	\$2745	\$2795	\$2845	\$2945

Makes a great desktop publishing system!

• Optional case styles available • FREE MS DOS 3.3 or 4.01

MS-DOS®, UNIX®, OS/2® & Novell® Compatible
Landmark: 35.6 - Norton: 28.2

**MicroLab Gives You
So Many Extras**

**FREE
SHIPPING***

**24-HOUR
NATIONWIDE
EXPRESS
SERVICE**

**30-DAY
"No Hassles"
Money Back
Guarantee**

**AP0/FPO
Orders Welcomed**

**LIFETIME
TOLL-FREE
Technical Support**

**FREE
MS DOS 3.3 or 4.01
WITH EVERY
SYSTEM**

MICROLAB

**"America's
Mail Order
Superstore"**

Corporate Offices:
23976 Freeway Park Drive
Farmington Hills, MI 48335

Mailing Address:
P.O. Box 317
Novi, MI 48376

ps. No Extras. No Kidding!

What better way to meld functionality, performance and ergonomics.

Solid construction. Flexible design.

Why settle for standard "me too" vendor fare?

Technical Support - On Our Dime

All MicroLab systems come with operations documentation and are easy to use. Should you require personal assistance, our technical support team is staffed by trained, courteous Systems Engineers ready to help. Just a toll free call away.

And everyone knows (800) calls are costly. So when MicroLab decided to offer NATIONAL TOLL FREE technical support, some people thought us either gluttons for expense...or confident our customers wouldn't have to use it too often.

We like to think we're just confident.

30 Day Money Back Guarantee

Your complete satisfaction is at the heart of every system we build.

So purchase your system with complete confidence. Put it through its paces. Kick the tires for 30 days.

If dissatisfied, simply contact us to initiate its expedient return and a prompt refund on the hardware price.

No questions. No hassles.

Iron Clad Warranty

MicroLab computers are rugged, solid performers built for compatibility and reliability.

We stand behind every system manufactured with a comprehensive 1 Year Limited Warranty on all required parts and labor.

Additionally, MicroLab offers its popular S.W.A.P. (Supplemental Warranty Assurance Program) Extended

Warranty Policy for additional warranty protection at a nominal price.

Be sure to ask your consultant for details.

MicroLab's Commitment

MicroLab is a wholly owned subsidiary of the National Microcomputer Research Institute, an organization dedicated to the advancement of microcomputer technology.

We've evolved into a preferred vendor for government, educational and corporate institutions alike.

We'd like nothing more than to be yours, too.

It's As Easy As Calling 1-800-677-7900

Whether you've got your eye on a pre-configured MicroLab system or need assistance configuring one, call us today.

The call's on us!

MICROLAB[®] 386/SX-16 & 386/SX-20



Next Day Service!

- 2MB RAM-expandable to 8 MB
- 1.2MB 5.25" Floppy Disk Drive
- 1.44MB 3.5" Floppy Disk Drive
- 65MB Hard Disk Drive
- High Speed 1:1 Interleave
- Hard/Floppy Disk Drive Controller
- 14" Super VGA 1024x768 Monitor
- 16 Bit VGA Adaptor with 512K
- 2 Serial, 1 Parallel & 1 Game Port
- 101 Key Tactile Switch Keyboard
- MS-DOS 3.3 or 4.01

MICROLAB[®] 286/12



Next Day Service!

- 1MB RAM-expandable to 4 MB
- 1.2MB 5.25" Floppy Disk Drive
- 1.44MB 3.5" Floppy Disk Drive
- 30MB Hard Disk Drive
- High Speed 1:1 Interleave
- Hard/Floppy Disk Drive Controller
- Hi-Res Monochrome Monitor
- Monochrome Video Adaptor
- 2 Serial, 1 Parallel & 1 Game Port
- 101 Key Tactile Switch Keyboard
- MS-DOS 3.3 or 4.01

MICROLAB[®] XT/12



Next Day Service!

- 640KB RAM-expandable to 1MB
- 360KB 5.25" Floppy Disk Drive
- 30MB Hard Disk Drive
- Hard/Floppy Disk Drive
- Hi-Res Monochrome Monitor
- Monochrome Video Adaptor
- Serial, Parallel & Game Ports
- 101 Key Tactile Switch Keyboard
- MS-DOS 3.3 or 4.01

Complete Super VGA 65MB System \$1995*

Video Options — Include Monitor & Video Card							
MICROLAS 386/SX-16 Price Matrix	Mon- ochrome 12" 720x350	Mon- ochrome 14" 720x350	CGA Color 14" 640x480	EGA Color 14" 640x480	VGA Color 14" 640x480	VGA Multi 14" 640x480	VGA Hi-Res 14" 1024x768
386SX-16 1 Interleave	\$1345	\$1395	\$1495	\$1545	\$1595	\$1745	\$1845
386SX-16 1 Interleave	\$1395	\$1445	\$1545	\$1595	\$1645	\$1795	\$1895
386SX-16 1 Interleave	\$1435	\$1485	\$1585	\$1635	\$1685	\$1835	\$1935
386SX-16 1 Interleave	\$1475	\$1525	\$1625	\$1675	\$1725	\$1875	\$1975
386SX-16 1 Interleave	\$1515	\$1565	\$1665	\$1715	\$1765	\$1915	\$2015
386SX-16 1 Interleave	\$1555	\$1605	\$1705	\$1755	\$1805	\$1955	\$2055
386SX-16 1 Interleave	\$1595	\$1645	\$1745	\$1795	\$1845	\$2000	\$2100
386SX-16 1 Interleave	\$1635	\$1685	\$1785	\$1835	\$1885	\$2040	\$2140
386SX-16 1 Interleave	\$1675	\$1725	\$1825	\$1875	\$1925	\$2080	\$2180
386SX-16 1 Interleave	\$1715	\$1765	\$1865	\$1915	\$1965	\$2120	\$2220
386SX-16 1 Interleave	\$1755	\$1805	\$1905	\$1955	\$2005	\$2160	\$2260
386SX-16 1 Interleave	\$1795	\$1845	\$1945	\$1995	\$2045	\$2200	\$2300
386SX-16 1 Interleave	\$1835	\$1885	\$1985	\$2035	\$2085	\$2240	\$2340
386SX-16 1 Interleave	\$1875	\$1925	\$2025	\$2075	\$2125	\$2280	\$2380
386SX-16 1 Interleave	\$1915	\$1965	\$2065	\$2115	\$2165	\$2320	\$2420
386SX-16 1 Interleave	\$1955	\$2005	\$2105	\$2155	\$2205	\$2360	\$2460
386SX-16 1 Interleave	\$1995	\$2045	\$2145	\$2195	\$2245	\$2400	\$2500
386SX-16 1 Interleave	\$2035	\$2085	\$2185	\$2235	\$2285	\$2440	\$2540
386SX-16 1 Interleave	\$2075	\$2125	\$2225	\$2275	\$2325	\$2480	\$2580
386SX-16 1 Interleave	\$2115	\$2165	\$2265	\$2315	\$2365	\$2520	\$2620
386SX-16 1 Interleave	\$2155	\$2205	\$2305	\$2355	\$2405	\$2560	\$2660
386SX-16 1 Interleave	\$2195	\$2245	\$2345	\$2395	\$2445	\$2600	\$2700
386SX-16 1 Interleave	\$2235	\$2285	\$2385	\$2435	\$2485	\$2640	\$2740
386SX-16 1 Interleave	\$2275	\$2325	\$2425	\$2475	\$2525	\$2680	\$2780
386SX-16 1 Interleave	\$2315	\$2365	\$2465	\$2515	\$2565	\$2720	\$2820
386SX-16 1 Interleave	\$2355	\$2405	\$2505	\$2555	\$2605	\$2760	\$2860
386SX-16 1 Interleave	\$2395	\$2445	\$2545	\$2595	\$2645	\$2800	\$2900
386SX-16 1 Interleave	\$2435	\$2485	\$2585	\$2635	\$2685	\$2840	\$2940
386SX-16 1 Interleave	\$2475	\$2525	\$2625	\$2675	\$2725	\$2880	\$2980
386SX-16 1 Interleave	\$2515	\$2565	\$2665	\$2715	\$2765	\$2920	\$3020
386SX-16 1 Interleave	\$2555	\$2605	\$2705	\$2755	\$2805	\$2960	\$3060
386SX-16 1 Interleave	\$2595	\$2645	\$2745	\$2795	\$2845	\$3000	\$3100
386SX-16 1 Interleave	\$2635	\$2685	\$2785	\$2835	\$2885	\$3040	\$3140
386SX-16 1 Interleave	\$2675	\$2725	\$2825	\$2875	\$2925	\$3080	\$3180
386SX-16 1 Interleave	\$2715	\$2765	\$2865	\$2915	\$2965	\$3120	\$3220
386SX-16 1 Interleave	\$2755	\$2805	\$2905	\$2955	\$3005	\$3160	\$3260
386SX-16 1 Interleave	\$2795	\$2845	\$2945	\$2995	\$3045	\$3200	\$3300
386SX-16 1 Interleave	\$2835	\$2885	\$2985	\$3035	\$3085	\$3240	\$3340
386SX-16 1 Interleave	\$2875	\$2925	\$3025	\$3075	\$3125	\$3280	\$3380
386SX-16 1 Interleave	\$2915	\$2965	\$3065	\$3115	\$3165	\$3320	\$3420
386SX-16 1 Interleave	\$2955	\$3005	\$3105	\$3155	\$3205	\$3360	\$3460
386SX-16 1 Interleave	\$2995	\$3045	\$3145	\$3195	\$3245	\$3400	\$3500
386SX-16 1 Interleave	\$3035	\$3085	\$3185	\$3235	\$3285	\$3440	\$3540
386SX-16 1 Interleave	\$3075	\$3125	\$3225	\$3275	\$3325	\$3480	\$3580
386SX-16 1 Interleave	\$3115	\$3165	\$3265	\$3315	\$3365	\$3520	\$3620
386SX-16 1 Interleave	\$3155	\$3205	\$3305	\$3355	\$3405	\$3560	\$3660
386SX-16 1 Interleave	\$3195	\$3245	\$3345	\$3395	\$3445	\$3600	\$3700
386SX-16 1 Interleave	\$3235	\$3285	\$3385	\$3435	\$3485	\$3640	\$3740
386SX-16 1 Interleave	\$3275	\$3325	\$3425	\$3475	\$3525	\$3680	\$3780
386SX-16 1 Interleave	\$3315	\$3365	\$3465	\$3515	\$3565	\$3720	\$3820
386SX-16 1 Interleave	\$3355	\$3405	\$3505	\$3555	\$3605	\$3760	\$3860
386SX-16 1 Interleave	\$3395	\$3445	\$3545	\$3595	\$3645	\$3800	\$3900
386SX-16 1 Interleave	\$3435	\$3485	\$3585	\$3635	\$3685	\$3840	\$3940
386SX-16 1 Interleave	\$3475	\$3525	\$3625	\$3675	\$3725	\$3880	\$3980
386SX-16 1 Interleave	\$3515	\$3565	\$3665	\$3715	\$3765	\$3920	\$4020
386SX-16 1 Interleave	\$3555	\$3605	\$3705	\$3755	\$3805	\$3960	\$4060
386SX-16 1 Interleave	\$3595	\$3645	\$3745	\$3795	\$3845	\$4000	\$4100
386SX-16 1 Interleave	\$3635	\$3685	\$3785	\$3835	\$3885	\$4040	\$4140
386SX-16 1 Interleave	\$3675	\$3725	\$3825	\$3875	\$3925	\$4080	\$4180
386SX-16 1 Interleave	\$3715	\$3765	\$3865	\$3915	\$3965	\$4120	\$4220
386SX-16 1 Interleave	\$3755	\$3805	\$3905	\$3955	\$4005	\$4160	\$4260
386SX-16 1 Interleave	\$3795	\$3845	\$3945	\$3995	\$4045	\$4200	\$4300
386SX-16 1 Interleave	\$3835	\$3885	\$3985	\$4035	\$4085	\$4240	\$4340
386SX-16 1 Interleave	\$3875	\$3925	\$4025	\$4075	\$4125	\$4280	\$4380
386SX-16 1 Interleave	\$3915	\$3965	\$4065	\$4115	\$4165	\$4320	\$4420
386SX-16 1 Interleave	\$3955	\$4005	\$4105	\$4155	\$4205	\$4360	\$4460
386SX-16 1 Interleave	\$3995	\$4045	\$4145	\$4195	\$4245	\$4400	\$4500
386SX-16 1 Interleave	\$4035	\$4085	\$4185	\$4235	\$4285	\$4440	\$4540
386SX-16 1 Interleave	\$4075	\$4125	\$4225	\$4275	\$4325	\$4480	\$4580
386SX-16 1 Interleave	\$4115	\$4165	\$4265	\$4315	\$4365	\$4520	\$4620
386SX-16 1 Interleave	\$4155	\$4205	\$4305	\$4355	\$4405	\$4560	\$4660
386SX-16 1 Interleave	\$4195	\$4245	\$4345	\$4395	\$4445	\$4600	\$4700
386SX-16 1 Interleave	\$4235	\$4285	\$4385	\$4435	\$4485	\$4640	\$4740
386SX-16 1 Interleave	\$4275	\$4325	\$4425	\$4475	\$4525	\$4680	\$4780
386SX-16 1 Interleave	\$4315	\$4365	\$4465	\$4515	\$4565	\$4720	\$4820
386SX-16 1 Interleave	\$4355	\$4405	\$4505	\$4555	\$4605	\$4760	\$4860
386SX-16 1 Interleave	\$4395	\$4445	\$4545	\$4595	\$4645	\$4800	\$4900
386SX-16 1 Interleave	\$4435	\$4485	\$4585	\$4635	\$4685	\$4840	\$4940
386SX-16 1 Interleave	\$4475	\$4525	\$4625	\$4675	\$4725	\$4880	\$4980
386SX-16 1 Interleave	\$4515	\$4565	\$4665	\$4715	\$4765	\$4920	\$5020
386SX-16 1 Interleave	\$4555	\$4605	\$4705	\$4755	\$4805	\$4960	\$5060
386SX-16 1 Interleave	\$4595	\$4645	\$4745	\$4795	\$4845	\$5000	\$5100
386SX-16 1 Interleave	\$4635	\$4685	\$4785	\$4835	\$4885	\$5040	\$5140
386SX-16 1 Interleave	\$4675	\$4725	\$4825	\$4875	\$4925	\$5080	\$5180
386SX-16 1 Interleave	\$4715	\$4765	\$4865	\$4915	\$4965	\$5120	\$5220
386SX-16 1 Interleave	\$4755	\$4805	\$4905	\$4955	\$5005	\$5160	\$5260
386SX-16 1 Interleave	\$4795	\$4845	\$4945	\$4995	\$5045	\$5200	\$5300
386SX-16 1 Interleave	\$4835	\$4885	\$4985	\$5035	\$5085	\$5240	\$5340
386SX-16 1 Interleave	\$4875	\$4925	\$5025	\$5075	\$5125	\$5280	\$5380
386SX-16 1 Interleave	\$4915	\$4965	\$5065	\$5115	\$5165	\$5320	\$5420
386SX-16 1 Interleave	\$4955	\$5005	\$5105	\$5155	\$5205	\$5360	\$5460
386SX-16 1 Interleave	\$4995	\$5045	\$5145	\$5195	\$5245	\$5400	\$5500
386SX-16 1 Interleave	\$5035	\$5085	\$5185	\$5235	\$5285	\$5440	\$5540
386SX-16 1 Interleave	\$5075	\$5125	\$5225	\$5275	\$5325	\$5480	\$5580
386SX-16 1 Interleave	\$5115	\$5165	\$5265	\$5315	\$5365	\$5520	\$5620
386SX-16 1 Interleave	\$5155	\$5205	\$5305	\$5355	\$5405	\$5560	\$5660
386SX-16 1 Interleave	\$5195	\$5245	\$5345	\$5395	\$5445	\$5600	\$5700
386SX-16 1 Interleave	\$5235	\$5285	\$5385	\$5435	\$5485	\$5640	\$5740
386SX-16 1 Interleave	\$5275	\$5325	\$5425	\$5475	\$5525	\$5680	\$5780
386SX-16 1 Interleave	\$5315	\$5365	\$5465	\$5515	\$5565	\$5720	\$5820
386SX-16 1 Interleave	\$5355	\$5405	\$5505	\$5555	\$5605	\$5760	\$5860
386SX-16 1 Interleave	\$5395	\$5445	\$5545	\$5595	\$5645	\$5800	\$5900
386SX-16 1 Interleave	\$5435	\$5485	\$5585	\$5635	\$5685	\$5840	\$5940
386SX-16 1 Interleave	\$5475	\$5525	\$5625	\$5675	\$5725	\$5880	\$5980
386SX-16 1 Interleave	\$5515	\$5565	\$5665	\$5715	\$5765	\$5920	\$6020
386SX-16 1 Interleave	\$5555	\$5605	\$5705	\$5755	\$5805	\$5960	\$6060
386SX-16 1 Interleave	\$5595	\$5645	\$5745	\$5795	\$5845	\$6000	\$6100
386SX-16 1 Interleave	\$5635	\$5685	\$5785	\$5835	\$5885	\$6040	\$6140
386SX-16 1 Interleave	\$5675	\$5725	\$5825	\$5875	\$5925	\$6080	\$6180
386SX-16 1 Interleave	\$5715	\$5765	\$5865	\$5915	\$5965	\$6120	\$6220
386SX-16 1 Interleave	\$5755	\$5805	\$5905	\$5955	\$6005	\$6160	\$6260
386SX-16 1 Interleave	\$5795	\$5845	\$5945	\$5995	\$6045	\$6200	\$6300
386SX-16 1 Interleave	\$5835	\$5885	\$5985	\$6035	\$6085	\$6240	\$6340
386SX-16 1 Interleave	\$5875	\$5925	\$6025	\$6075	\$6125	\$6280	\$6380
386SX-16 1 Interleave	\$5915	\$5965	\$6065	\$6115	\$6165	\$6320	\$6420
386SX-16 1 Interleave	\$5955	\$6005	\$6105	\$6155	\$6205	\$6360	\$6460
386SX-16 1 Interleave	\$5995	\$6045	\$6145	\$6195	\$6245	\$6400	\$6500
386SX-16 1 Interleave	\$6035	\$6085	\$6185	\$6235	\$6285	\$6440	\$6540
386SX-16 1 Interleave	\$6075	\$6125	\$6225	\$6275	\$6325	\$6480	\$6580
386SX-16 1 Interleave	\$6115	\$6165	\$6265	\$6315	\$6365	\$6520	\$6620
386SX-16 1 Interleave	\$6155	\$6205	\$6305	\$6355	\$6405	\$6560	\$6660
386SX-16 1 Interleave	\$6195	\$6245	\$6345	\$6395	\$6445	\$6600	\$6700
386SX-16 1 Interleave	\$6235	\$6285	\$6385	\$6435	\$6485	\$6640	\$6740
386SX-16 1 Interleave	\$6275	\$6325	\$6425	\$6475	\$6525	\$6680	\$6780
386SX-16 1 Interleave	\$6315	\$6365	\$6465	\$6515	\$6565	\$6720	\$6820
386SX-16 1 Interleave	\$6355	\$6405	\$6505	\$6555	\$6605	\$6760	\$6860
386SX-16 1 Interleave	\$6395	\$6445	\$6545	\$6595	\$6645	\$6800	\$6900
386SX-16 1 Interleave	\$6435	\$6485	\$6585	\$6635	\$6685	\$6840	\$6940
386SX-16 1 Interleave	\$6475	\$6525	\$6625	\$6675	\$6725	\$6880	\$6980
386SX-							

All the monitors you'll need for

What you see is the remarkable MultiSync® 3D color monitor from NEC. What you don't see is how this one 14" monitor can accommodate not only the broadest range of current mainstream standards, but also the next standards to become mainstream—8514/A and XGA, with brilliant color resolution of 1024 x 768.



Built around our award-winning multiple frequency technology, this one monitor automatically adjusts to frequencies from CGA all the way up to 8514/A and XGA. Which means even if you haven't moved up to 8514/A or XGA yet, you have the opportunity to purchase a monitor through foresight, rather than hindsight.

MultiSync is a registered trademark of NEC Technologies, Inc.IBM PC/XT/AT PS/2 and 8514/A are registered trademarks of the International Business Machines Corporation.Macintosh is a registered trademark of Apple Computer, Inc.

Computers and Communications

all the resolutions you'll need.

Especially since the MultiSync 3D also has a microprocessor-based digital control system that provides automatic screen configuration, lets you select the ideal resolution for your software, and even has a



memory that recalls your preferred screen settings.

And it's also compatible with the IBM PC/XT/AT, PS/2 and the Macintosh computer systems.

Now, since NEC is ready to accommodate even the newest graphics standards to emerge, maybe the real question is: Are you?

NEC is a registered trademark of NEC Corporation

For literature call NEC at 1-800-826-2255. For details, call 1-800-FONE-NEC. And in Canada, call 1-800-268-3997.

© 1990 NEC Technologies, Inc.

NEC

CIRCLE 153 ON READER SERVICE CARD



If You Think It Takes This Many Steps To Create A Database, Try Q&A.

Creating a database doesn't have to be a giant struggle. Because with Q&A™ software, you can create a database in two easy steps.

Just type in a list of database items (like Name:, Address:, Price:, etc). Then, tap a function key. That's it. You've created a database that's ready to use.

Q&A is the fastest way to create databases for mailings, invoicing, customer and equipment tracking, expense reports, you name it. And because it's packed with award-winning* power features like multi-file database lookup, sophisticated reporting, and multi-user network support, Q&A is perfect for experts. As well as beginners.

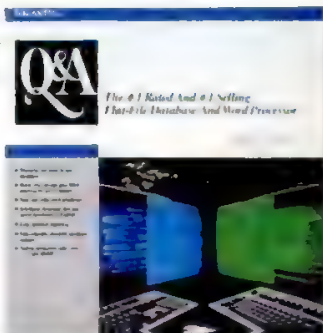
That's why managers at companies like PepsiCo and American Express build their own database solutions the easy way. With Q&A.

Try it today. You'll get database work done fast. And be a big step ahead of everyone else.

FREE DEMO DISK, (800) 228-4122 Ext. 461P
(Ask About the Q&A Trial Size for \$9.95)

SYMANTEC.

*The Database That
Can Do It, Today.*



Symantec Corporation, 10201 Torre Avenue, Cupertino, CA 95014. 408/253-9600.

*Q&A awards: #1 Corporate Satisfaction PC Week 1/89, Software Digest #1 Network File Manager 1/90 and #1 File Manager 2/88, PC World's World Class 9/88 and 9/89, InfoWorld 9/3 rating 5/88, PC Magazine Editor's Choice '87 and '88, and Technical Excellence 1988. Q&A is a trademark of Symantec Corporation.
© 1990 Symantec Corporation

CIRCLE 344 ON READER SERVICE CARD

by
Gus Venditto

Advisor

CUTTING THE NOISE

In my very quiet office, the noise of my Dell computer is so annoying that I keep it turned off as much as I can. I'm not sure if the problem is the fan, power source, or 150MB hard drive. Could you recommend replacement components that would make a big difference in the noise? Or if I were to look for a new computer, what would you recommend?

Thomas Hirsh
Evanston, Illinois



Most PCs generate constant noise. The cause is one of the machine's only moving parts: the fan inside the power supply.

You can't replace the fan without replacing the power supply (unless you're a proficient electronics whiz) but you can replace the entire power supply for a modest amount.

PC Cooling Systems (Bonsall, Calif.; 800-722-6555) has a variety of replacements. For your system, I'd recommend the Silencer 270. According to PC Cooling's tests, it cuts the racket by 75 percent; it costs \$179.

EXPANDING ANSI DISPLAY MAPPING

I'm looking for a program that will allow me to remap the standard ASCII character set for the screen. I merely want to create new images on the monitor, and not in any way change how the computer handles them internally. Nor am I looking for screen fonts.

Stephen Hunter
Seven Fountains, Virginia



You should first explore the remapping possible with ANSI.SYS loaded. Using the PROMPT command, you can use escape sequences that will replace the value of a key with a different key or even with an entire command. Your DOS manual has documentation on using the ANSI escape sequences.

■ **CUTTING THE NOISE:**
Relief from the constant hum of a loud power supply.

■ **EXPANDING ANSI DISPLAY MAPPING:**
Software that takes the ANSI display driver a couple of steps farther.

■ **MODEL 30 UPGRADE CHOICES:**
Charting the best course for the move to a 386.

■ **A TRUCE BETWEEN DESQVIEW AND WINDOWS:**
An end to the need for separate CONFIG.SYS files.

■ **FIGHTING DUST:**
Worth the battle?

If you want to do a lot of this, there's a better implementation. *Fansi-Console* from Hersey Micro Consulting (Ann Arbor, Mich.; 313-994-3259) is a replacement for the ANSI.SYS driver that speeds up screen writes dramatically on any program that uses DOS calls to write to the screen, and also has a variety of programs that will help you remap the display. They sell the basic package for \$75 and a technical kit with extra documentation for \$119.

MODEL 30 UPGRADE CHOICES

I own a PS/2 Model 30 286 with 1MB RAM and I run *Windows* 3.0. I have been looking for an inexpensive upgrade from a 286 to a 386SX. Some friends have recommended replacing my whole motherboard, but since I'm in college and plan to up-

grade to a new system in three years, I want something a bit less drastic.

I have seen the All Charge Card by All Computer and while I think that's what I'm looking for, I haven't seen any others. Do you know of other companies or is this my only choice?

Also, would these give me 100-percent 386SX compatibility or just some of the memory features?

Dan Linder
Lincoln, Nebraska



I think you might be disappointed with the All Charge since it is strictly a memory manager: it lets your system use DOS's high-memory area to run programs. The 386 also lets you access this memory, but the similarities end there. The All Charge card would not let you run programs written for the 386 protected mode, so you'd still have to run *Windows* in the 286-compatible standard mode.

You also don't have any choices for replacing the motherboard in your Model 30. Not only is the PS/2 Model 30 286 a different size, it has VGA and several ports on the systemboard.

Even if you do happen to find a systemboard that would work, I don't think it would be cost-effective. With 386SX systems selling for about \$1,400, it's hard to justify a systemboard upgrade to SX level; these days, the most pragmatic systemboard upgrade would be to achieve 486 processing.

Until you're ready to purchase that new system, your best investment would be to buy more RAM. Current prices are \$175 for 2MB of Model 30-compatible memory. Most of the upgrades available through discount suppliers are replacements for the SIMM packs in your PS/2, so you'd have to replace the existing memory pack.

A RAM increase, especially when used with *Windows*' SMARTDRV.SYS disk cache would probably keep you happy while you save for a 32-bit computer.

Advisor

A TRUCE BETWEEN DESVIEW AND WINDOWS

I own a 20-MHz 386 and wish to use both *Microsoft Windows 3.0* and Quarterdeck's *DESQview 2.2*. The problem I've encountered is that these programs require distinct system configurations at boot-up.

I am currently using *PC Magazine's* utility *CONFIG.CTL* to change the system configuration during boot-up. Is there any other way of doing this?

Michael Hageman
Ames, Iowa



You can stop worrying about switching configurations and start concentrating on the best way to allocate your memory. Quarterdeck has caught up with the problem in its newest release of both *QEMM* and *DESQview*.

With *QEMM 5.1's* memory manager loaded, you can run *Windows* without *HIMEM.SYS* and still have access to the same amount of memory, and claim some of DOS's high memory area for TSR use.

It's fashionable to
denigrate preventive
maintenance on a
PC. Millions of
machines receive no
cleaning or service
and work fine for
years. The most
vulnerable area is the
keyboard.

DESQview 2.3 will let you multitask DOS applications with *Windows 3.0* programs, even DOS programs that run in 286 extended mode (like *Lotus 1-2-3*, Release 3.1) and 386 extended mode (like Borland's *Paradox 386*).

FIGHTING DUST

How valuable is a "dust cover" on a PC? Is this good preventive maintenance?

Arlene Goldstein
Brooklyn, New York



It's fashionable to denigrate preventive maintenance on a PC. Millions of machines receive no cleaning or service and work fine for years. Still it is possible you'll avoid a problem if you keep your system covered. Dirt is the enemy of all electronic components and while the most sensitive parts of your PC are well sealed, excessive accumulations of dust can gum up some of the moving parts.

In general, the most vulnerable area is the keyboard and the enemies are crumbs and beverages. Dust covers can help and so can periodic vacuuming.

ASK THE ADVISOR

Send your questions to PC Advisor, One Park Avenue, New York, NY 10016 or upload them to PC MagNet (see the instructions for joining on page 8 of this issue). Sorry, but personal replies are not possible.

Watch it!
of dollars are
company—five cents
increase will make
poorer—unless you do something.

Your best move? Get ArcList and from Group 1 Software to take advantage of postal discounts for ZIP+4® and Carrier coding—even postal barcoding. You rid your databases of costly duplicates, address standardization, send personal—and more. Installation is easy on your IBM-compatible PC

Hundreds, even thousands
disappearing from your com-
pany at a time. The latest postal
your company measurably

AccuMail
tage of
Route
can also
perform
ized letters,

What's 5¢ to a big company like yours?

(with 640K and hard disk)—there's even a LAN version available.

Don't let your company be nicked and dimed to death.
Call Group 1 Software for the dealer nearest you.

1-800-368-5806

GROUP 1
GROUP 1 SOFTWARE

6404 Ivy Lane, Suite 500, Dept. P-CM21
Greenbelt, Maryland 20770-1400

ZIP+4® CODING • POSTNET® BARCODING • PRESORTING • DUPLICATE ELIMINATION

ZIP+4® and POSTNET® are registered trademarks of the U.S. Postal Service. All others are registered trademarks of Group 1 Software, Inc. ©1990 Group 1 Software, Inc.

CIRCLE 339 ON READER SERVICE CARD

SERVICE AND RELIABILITY

IBM, COMPAQ[®] OR ZEOS[®]



#1 In Customers
who would
buy again.

#1 In Technical
Support.

#1 In Repair
Services.

In PC Magazine's
Service and
Reliability issue,
three top manu-
facturers of
386SX systems
were rated by
their customers.
One was the
clear winner.

**ZEOS. The #1
Choice for you!
Call anytime Toll
Free for Details.
800-423-5891**

CIRCLE 723 ON READER SERVICE CARD

ZEOS[®] 386SX

Now, You Can Move Up to the

386SX

ZEOS-386SX-16



**"WITH
SO MUCH
GOING
FOR IT HOW
COULD
YOU GO
WRONG?"**

-PC MAGAZINE

**YOU SIMPLY CAN'T
GO WRONG!**

**THE ZEOS 386SX IS
TRULY TOMORROW'S
COMPUTER TODAY.
PERFORMANCE.
QUALITY, PRICE AND
SUPPORT. THE AMAZ-
ING ZEOS '386SX.
THE VERY BEST IS
WAITING FOR YOU!**

**BE SURE TO
ASK ABOUT THE
INCREDIBLE NEW
ZEOS 386SX-20.
COMPLETE WITH A
BLAZING 64K SRAM
CACHE STANDARD!**

**CALL NOW TOLL FREE:
800-423-5891**



Only \$1295. World's Best 386SX!

ZEOS 386SX. EDITOR'S CHOICE.

"WITH SO MUCH GOING FOR IT HOW COULD YOU GO WRONG?" -PC MAGAZINE

You simply can't go wrong! That's the conclusion PC Magazine came to after comparing the ZEOS 386SX to 31 other machines. Editor's Choice!

"ZEOS comes in a winner... The fastest SX tested... packing plenty of value... great

expandability, quality parts and down to earth pricing... how could you go wrong?"

Editor's Choice.

Your ZEOS 386SX is simply the best money can buy. Because ZEOS knows '386 systems better than anyone. After all, PC Magazine chose ZEOS above 57 other manufacturers "For Overall Excellence" in their '386 Blockbuster issue.

The new ZEOS 386SX simply runs circles around every other 386SX out there (not to mention all those '286 based machines). As PC Magazine noted, the ZEOS 16MHz 386SX compares "favorably with the 20MHz '286 machines reviewed in 'The 80286: Unsafe at Higher Speeds?'" (PC Magazine, December 27, 1988).

So if you're in the market for '386 power at a terrific price, you may as well get the best money can buy. The

ZEOS 386SX. Nothing can touch it. It's the Editor's Choice, and it's your best choice as well.

GUARANTEED

30 DAY ABSOLUTE SATISFACTION GUARANTEE. ONE FULL YEAR LIMITED WARRANTY.

If a company believes in their product, they should stand Rock Solid behind it. That's why your new ZEOS 386SX hard drive system includes our

famous 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and Express Parts Replacement Policy.

PC LABS BENCHMARK SERIES RELEASE 5.0

	Instruction Mix	Floating Point Calculation	Conventional Memory
ZEOS 386SX/16	3.99	6.98	0.49
IBM PS/2 Model 50Z	5.68	11.21	0.82
Compaq Deskpro 386S	4.48	9.67	0.83

TECH SUPPORT

24 HOUR A DAY SALES AND TOLL FREE TECHNICAL SUPPORT!

And talk about service! ZEOS was the first computer company in America to offer you *Toll Free Technical Support 24 hours a day, 365 days a year.* Nobody stands by their customers like ZEOS!

Order your new ZEOS 386SX now with confidence. Your choice of ZEOS quality and performance is *Guaranteed.* Order now by calling 800-423-5891.

THE NEW ZEOS 386SX 16MHz HARD DRIVE SYSTEM. EDITOR'S CHOICE!

ONLY \$1295

20MHz available too!

The ZEOS 386SX is the best in the world! It's the fastest money can buy. Starting at only \$1295. Call now for details!

- Intel 386SX-16 (or 20MHz) CPU.
- 512K DRAM, expandable to a System Total of 16MB. Caching 20MHz system comes with 64K Cache standard.
- Shadow RAM and EMS Support.
- 42 MB ultrafast IDE drive. 1.2MB Teac floppy drive.
- Genuine Hercules brand graphics controller. 14" High-Res Amber Display with Tilt/Swivel Base.
- ZEOS/RS Enhanced Tactile/Click keyboard.
- 2 High Speed Serial Ports plus one Parallel and one Game Port.
- 6-16, 2-8 bit expansion slots. 80387SX support.
- Custom ZEOS Space Saver case with Security Lock and LEDs. 200 watts of power!
- Two cooling fans for added reliability and product life.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Many other options are available too. Call now for more special money saving packages!

ORDER NOW TOLL FREE
800-423-5891

FAX Dial: 612-633-1325
In Minnesota: 612-633-4591
Outside US/Canada:
612-633-6131
Government Orders:
800-245-2449
MasterCard, VISA, Am Exp.
Z-CARD and COD
Open 24 Hours a day,
365 Days a year!



All prices and specifications are subject to change without notice. Please call for current pricing and warranty details. ZEOS is a publicly traded company. NASDAQ Symbol: ZEOS. © 1989 ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112. All product and company names are trademarks or registered trademarks of their respective holders.

CIRCLE 493 ON READER SERVICE CARD

RISC FREE!

Free i860™ Processor and i860/APX Software!

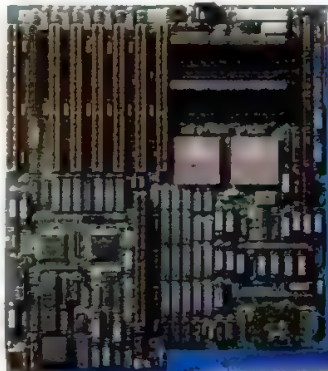
By now, you've probably heard about our industry-first 4860™ MotherBoard that packs the power of the Intel 80486 CPU with the Intel 80860 RISC processor (i486™ + i860 = 4860).

What you haven't heard is that, for a limited time, when you buy a 4860 MotherBoard with 8MB of RAM, Hauppauge will give you an i860 RISC processor and the i860/APX operating system at no additional cost.

Why *give* you this capability? Because you'll enjoy a level of processor performance never before seen in a PC. Our bet is that you'll be so impressed, you'll come back for more!

A PC Revolution: In the PC environment, the 4860 is a 486-based MotherBoard with the new EISA I/O bus. It runs over 2 times faster than 386 computers and delivers mainframe power for applications including CAD, LAN and desktop publishing. This board is fully compatible with DOS, IBM's OS/2, Novell Network and SCO UNIX. What's more, Hauppauge's 4860 supports up to 64 MBytes of memory *without* a RAM expansion board.

RISC-Y Business: The i860 processor is ideal in complex applications, performing up to 25 million floating-point operations per second. It adds to the power of the 486, so you can run rings around ordinary PCs.



By adapting Intel's APX (Attached Processor Executive) software to our 4860 MotherBoard, we've created a way to exploit the power of the i860 to give you *practical* multiprocessing. In fact, i860/APX provides a base for entirely new applications made possible by the advent of the i860 RISC processor.

Technical Features: 25 or 33MHz 486/860 • 4 Mbytes of high speed RAM expandable to 64 Mbytes shared between i486 and i860 processors • Socket for optional Intel Turbo Cache 485™ and Weitek 4167 • 7 EISA I/O slots • 64-bit expansion slot for optional high-speed graphic frame buffer • 1 parallel, 2 serial ports and a built-in PS/2-style mouse port.

Enjoy a RISC-free investment. Our 4860 MotherBoard is designed with the world's highest performing microprocessors. So you can have the world's highest performing PCs and workstations.

For more information, call 1-800-443-6284.

Hauppauge Computer Works, Inc.
91 Cabot Court
Hauppauge, New York 11788
Telephone: 516-434-1600
Fax: 516-434-3198
In Europe (+9) 2161-17063
In Australia: (7) 262-3122

Hauppauge!

available at your local computer dealer.

CIRCLE 276 ON READER SERVICE CARD

First Looks

Hands-on Reviews of the Latest Products

Autodesk's 3D Studio Brings Advanced Animation to the PC Platform at a Price

HANDS ON
by Lucas Simone

Autodesk's \$2,995 *3D Studio* will change the shape of PC-based graphics. Five different modules: a 2D Shaper, 3D Loftter, 3D Editor, Materials Editor, and Keyframer let you create and animate solid objects in perspective space.

These modules correspond to the process of creating three-dimensional animations (See sidebar: "The Making of An Animation"). You draw a two-dimensional profile, and then extrude or lathe the shape into the third dimension. The resultant 3-D objects are arranged into a scene with specified light sources and camera positions. Each object is assigned a surface texture and a motion before the animation is rendered.

In fact, if you are working with a simple concept you can produce an animation almost immediately, because *3D Studio*'s vector objects function much as their counterparts do in real life. So, to move further away from an object, you either move the wireframe representation of it, or relocate your viewing position (camera) to a new spot.

When the time comes to record movement, the Keyframer makes everything extremely simple. Just advance to a specific frame of your film, and then set up (or key) the target positions of both the objects and the cameras. The program thus automatically creates the intervening frames, computing not just the motion paths of the objects, but also the effects of the light sources, and camera posi-

tions as well.

Many of the techniques employed by *3D Studio* are common on dedicated graphics workstations. So, be prepared—you'll need the PC equivalent (an 80386 with a math coprocessor, or a 486) in order to run this computationally intensive program. And though you can use the product with a VGA monitor, you'll probably want a Targa system to get the full benefit of *3D Studio*'s shading and antialiasing algorithms.

Like a camel, *3D Studio*'s learning curve has two humps. You very quickly reach proficiency for easy tasks, but the cycle legitimately starts from the bottom again when you learn about the program's more-advanced features. So, users of vector-based drawing programs will feel comfortable with many functions in the 2D Shaper. But it may take some time to understand how seemingly insignificant details—such as the position of a polygon's first ver-

February 26
REVIEW INDEX

Video Toaster

An Amiga board that'll work wonders for your PC video36

Forest & Trees for Windows

A new view on data integration and monitoring.....38

Kodak Color 4 and Canon BJ-330 printers

Two new ink jets for text and graphics43

tex—can adversely affect the final appearance of three-dimensional objects.

Likewise the basic concept of the 3D Loftter is straightforward; you extrude a two-dim-

CONTINUES ON PAGE 34

ObjectVision: Visual Data Entry Applications Generator

PREVIEW
by Ray Duncan

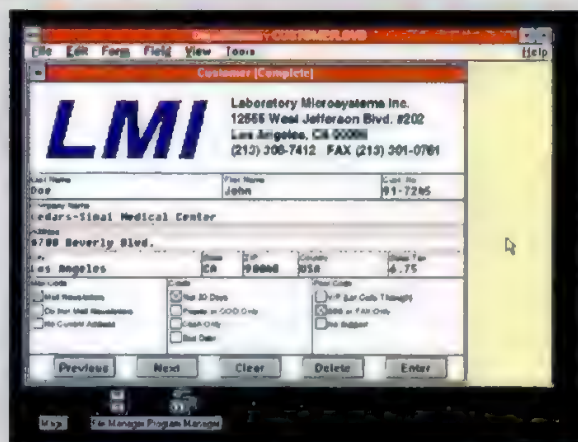
Borland's *ObjectVision* is an innovative development tool for Windows 3.0 that combines aspects of a form design program, a spreadsheet, a database, and a hypermedia authoring system. Yet *ObjectVision* is really none of these things; instead, it defines a new Windows product niche. Borland has leveraged its expertise with *Paradox*, *Quattro Pro*, and integrated environments to come up with a rather novel, object-oriented, visually controlled generator of Win-

dows data entry applications.

An *ObjectVision* application is based on a "forms" metaphor and is built up using four tools: the Form tool, the Tree tool, the Stack tool, and the Link tool. All of the tools are used by pointing, dragging, and resizing objects of various types with the keyboard or mouse, and by picking options from menus and dialog boxes. As the application takes shape, the developer can quickly cycle back and forth between the tools and user mode to experiment with the design.

No programming in the tra-

CONTINUES ON PAGE 35



This simple *ObjectVision* application took less than 30 minutes to design and test, and required no traditional programming. This form allows records in a company's database to be added, changed, or deleted. It relies on a decision tree to automatically calculate the value in the sales tax field, based on the state and ZIP code.

First Looks

3D Studio

CONTINUED FROM PAGE 33

sional outline along a predefined path. But techniques that allow you to create memory-efficient yet visually complex objects will take time to master. Deformation grids, for example, allow you to shape, scale, twist, and bevel objects as you loft them.

In an uncharacteristic reversal, *3D Studio* encourages you to learn about the broader world outside of computer graphics. Understanding photography will help you to choose the right millimeter lens when you configure cameras in the 3D Editor. And a smidgen of physics will come in handy when you first approach the Materials Editor, where you use RGB and HSL

models to set ambient, diffuse, and specular properties for surfaces.

The Keyframer, where you create your animations, uses 3-D wireframe representations to show you what happens when you apply any combination of the four basic motions—move, rotate, scale, or morph—to your objects. Neophytes can pick up the essentials of animation quickly. More sophisticated effects are possible through functions such as hierarchical links—so that when you move someone's hand their arm follows naturally. In addition, the Track Info and Key Info dialog boxes give savvy animators a way to fine-tune the action by editing a script of each object's motion.

A truly elegant rendering function (available from both the 3D Editor and the Keyframer) handles transparencies

and reflective surfaces, as well as atmospheric effects. External raster files in .GIF, .TIF, .TGA, .FLI, or .CEL formats can be used to create texture and bump maps, or to paint a background. Most importantly, four levels of shading (wireframe, flat, gourand, and phong) give realistically smooth surfaces to your creations.

Though a more-consistent interface would be welcome, right now *3D Studio* works within the limitations of the standard VGA display. Most of the modules use a high-resolution VGA workspace very similar to *AutoCAD*—multiple views and a branching command structure make it easy to find commands and manipulate objects.

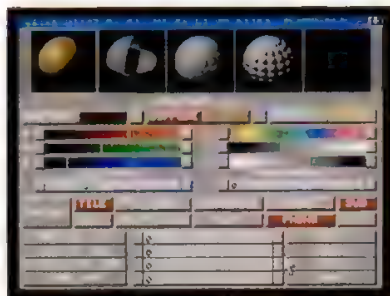
The Materials Editor, which requires at least 256 colors for semirealistic rendering, graciously switches the display to

MCGA mode, but the interface displays all of the quirky icons and menus that are so annoying in Autodesk's *Animator* ("Autodesk Animator Brings Affordable Full-Screen Animation to the PC," *First Looks*, November 28, 1989). You can configure the Materials Editor to use a Targa system for much higher quality output—though you'll have to manually edit the configuration file in a word processor in order to do so.

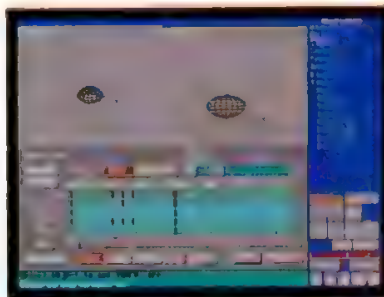
3D Studio is currently best suited to creating animations of manmade creations, like logos and buildings, both because the geometry is simpler, and because the program imports *AutoCAD* .DXF files. VGA-based animations can take advantage of *3D Studio*'s runtime playback facility but Targa users will need to output to video. Autodesk has anticipated the only serious criticism of this product and announced that a future version will support Pixar RenderMan technology for true photorealistic (and more naturalistic) animation.

Even at a list price of \$2,995, Autodesk's *3D Studio* is absolutely nothing short of graphics dynamite. Whether your application is product design, architectural walk-throughs, or business presentations—*3D Studio* has the power to wow your audience. ■

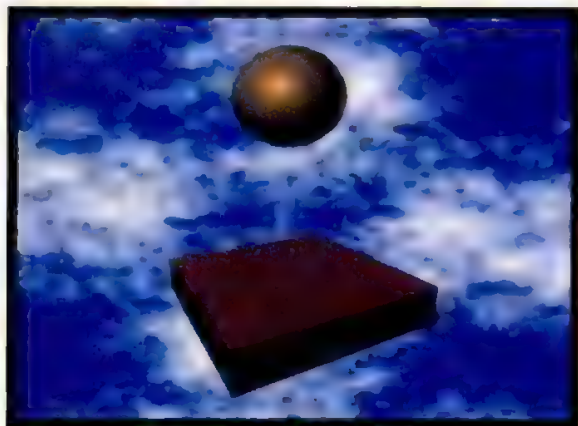
THE MAKING OF 3-D STUDIO ANIMATION



The buttons at the bottom of the screen allow you to create bump, texture, opacity, and reflection maps from imported bitmaps.



3D Studio can write animations to disk in either MCGA or Targa resolution. This Targa file utilizes a bitmapped background of clouds, and fully rendered 3-D objects.



The top left window shows frame 15 of our sample animation—the point at which the ball squashes (see menu at right) in its bounce. The Track Info dialog box provides a script of the ball's movement.

by Luisa Simone

PC
MAGAZINE

FACT FILE

Autodesk 3D Studio
Autodesk Inc., 2320 Marinship Way, Sausalito, CA 94965; 415-332-2344.
List Price: \$2,995.
Requires: 80386 with math coprocessor, or 80486; hard disk, 3MB RAM, DOS 3.3 or later, mouse or digitizing tablet, VGA graphics adapter.
In Short: Autodesk's *3D Studio* brings the power of workstation animation to PCs. Though the interface is idiosyncratic, and the hardware requirements steep, the toolset is—in a word—spectacular. Three-dimensional modeling, keyframe capability, and surface mapping make this an ideal program for both the beginning animator and the seasoned professional.

CIRCLE 448 ON READER SERVICE CARD

First Looks

ObjectVision

CONTINUED FROM PAGE 33

ditional sense is required; for that matter, *ObjectVision* doesn't support or need a procedural programming language.

The WYSIWYG Form tool is used to design forms, which are the fundamental user interface of an *ObjectVision* application. Each form is in turn divided into fields that accept or display data, and the form may also be decorated with text labels and with graphic objects that are pasted in from another *Windows* painting or drawing program. Fields can be configured for free text, constrained numeric values, pictured data (e.g. phone numbers or dates), lists of options, or as buttons that trigger another action within the application.

The Tree tool allows the developer to create and modify graphical decision trees that are attached to fields; such trees assign calculated or looked-up values to a field based on the contents of other fields. A tree is assembled incrementally, by entering and arranging dependent field names, comparison values for branching, and conclusion values or expressions. The interactive nature of the environment makes the refinement and debugging of decision trees very easy. *ObjectVision* supports a fairly extensive subset of *Quattro Pro*'s expression

operators and functions.

The Stack tool displays the relationship between forms; when an application more than one, it can also be used to alter the arrangement of forms. The first form seen is called the "goal form." Other forms are displayed if and when the information they accept or calculate is needed. For example, a subsidiary form will be presented to the user if one of its fields is empty and the value in that field is required by a decision tree on the goal form.

The Link tool establishes linkages between fields in *ObjectVision* forms and the fields of an existing *Paradox*, *dBASE*, or *Btrieve* database. *ObjectVision* can also independently create and maintain indexed databases of all three types (with some restrictions), and can exchange data with nonsupported databases via comma-delimited ASCII files. If you have a true *Windows* application that can function as a database, such as *Microsoft Excel*, you can establish DDE (dynamic data exchange) links with that application and let it do the hard work.

Although the version of *ObjectVision* tested was only a beta release, I was impressed with its performance, reliability, and documentation. The tutorial and example applications are helpful, and I encountered no unexpected program terminations or mangling of data files at all. Although *ObjectVision*'s tools interface could use a bit of streamlining, a usable application can

be constructed in an amazingly short time.

For example, in less than 30 minutes I put together an application which can be used to add, change, or delete entries in a company's customer database. Part of this required the creation of a simple decision tree attached to the sales tax field, which assigned a value to the field based on the contents of the state and ZIP code fields.

ObjectVision is highly optimized for its chosen task, but the tradeoff is that *ObjectVision* doesn't tread outside its chosen domain; its capabilities are narrowly defined compared to products like *Asymetrix Tool-Book* and *HyperCard* on the Macintosh. You can't re-sort or reindex your database, select record sets, or print reports using *ObjectVision*. Instead, these chores must be tackled using the database's native commands and programming facilities.

Indeed, you can't print much of anything from *ObjectVision*, except for form layouts and decision trees. You can't make fancy pictures with *ObjectVision* alone, either; its drawing tools are basically limited to text, lines, and filled rectangles.

However, these limitations should be viewed as features rather than bugs. For years, I've been hearing about how traditional, monolithic applications will be outmoded by small, special-purpose tools that take advantage of *Windows*' multitasking and DDE facilities, and how these will be readily plugged to-

gether by the end user in configurations to meet unique needs.

In *ObjectVision*, we have the first glimmerings of hope that such a utopia may actually materialize. Once again, Borland has earned our thanks by taking some risks, living a little dangerously, and placing an affordable, cutting-edge, GUI-based, object-oriented software technology in the hands of the average user.

Borland expects to ship *ObjectVision* in late February. As we went to press, pricing and runtime version availability were not finalized although it's expected that *ObjectVision* will be priced comparable to spreadsheet products. ■



FACT FILE

ObjectVision, Version 1.1 (beta release)

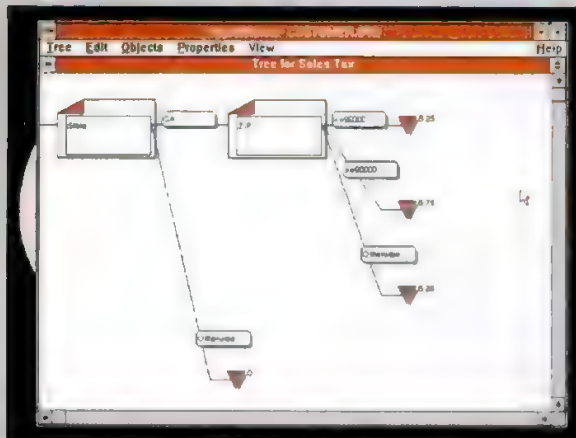
Borland International Inc., 1800 Green Hills Rd., Scotts Valley, CA 95066; 800-331-0877, 408-438-8400.

List Price: Not available at press time.

Requires: 640K RAM (more recommended), hard disk with at least 1.5MB of free space (more recommended), DOS 3.1 or later, *Microsoft Windows* 3.0.

In Short: An innovative, visual application generator for *Windows* 3.0. Easily integrated with existing *Paradox*, *dBASE*, or *Btrieve* applications and databases. Supports DDE (dynamic data exchange) with other *Windows* applications.

CIRCLE 440 ON READER SERVICE CARD



An example of an *ObjectVision* decision tree, attached to the sales tax field as shown in the figure on Page 33. The tree contains two decision points and four "conclusion" nodes which define the possible values for the sales tax. If the state is not California, the sales tax is zero. If the state is California and the ZIP code is in the range 90000-91899, the sales tax is 6.75 percent, otherwise it is 6.25 percent. (California State Board of Equalization: Please don't send me any outraged letters, this decision tree is for demonstration purposes only.) The tree is evaluated left to right and top to bottom until a conclusion node is reached, then the field's value is updated accordingly. Conclusion nodes can be simple literal values or can be complex expressions or database lookups (*ObjectVision* supports a fairly extensive subset of *Quattro Pro*'s expression operators and functions.)

First Looks

The Video Toaster Teaches Your PC New Video Tricks

HANDS ON
by Steve Rosenberg

The Amiga has always been a fundamentally better video machine than the PC, but there's never been a more compelling reason for PC users to incorporate the Amiga's video magic than the Video Toaster.

The "Toaster" is a \$1,595 add-on board/software combo from NewTek designed to work only with Commodore's machines. But the possibility of shipping PC images to the Toaster to add video effects or sending Toaster images to the PC for use in presentations has PC-based multimedia producers busy figuring out ways to link these machines together.

PC users can think of the Toaster as a video printer peripheral for the PC—it processes video in ways that the PC simply can't. Even though you need an Amiga 2000-series machine to host the Toaster, the net result is still a relative bargain: The Amiga/Toaster combo brings to the PC most of the same functionality as professional video editing and switching equipment that costs from 10 to 50 times the price. The Toaster provides you with the basic real-time tools you need to change hum-drum computer video into the type of embellished, exciting video you're accustomed to seeing in professional productions.

The backbone of the Toaster is a switcher that can select from among any of four synchronous (genlocked) video sources, providing both preview and program outputs. In other words, you can weave four distinct sources into a presentation—precisely the thing to enable you to easily switch from an on-screen image to a live presenter during a training video, or from a title screen to an opening sequence in a marketing production.

The Toaster requires syn-

chronized (genlocked) signals, but it can synchronize its own internal images with a single outside video source. If you want to switch between two video cameras or between cameras and recorded video you'll need to use more costly industrial or professional-level sources that provide the required time-base correction and genlocking.

The Toaster lets you do much more than orchestrate straight cuts between timed sources. It also includes a digital video effects (DVE) and special effects generator (SEG) for dissolves, wipes, and dozens of more-complex transitions.

For example, if you wanted to start your production with one image growing from a tiny point, flipping over twice and taking over the screen, you'd just pick the icon for this effect from the dozens of such available effects, and apply it. There's full luminance keying (overlay determined by point-by-point brightness), but chroma keying (by color) will have to wait for a promised future add-on daughtercard.

For creating images on the Amiga, the Toaster includes a full video-oriented paint pro-



FACT FILE

The Video Toaster, Version 1.0

NewTek Inc., 215 E. 8th St., Topeka, KS 66603; 800-843-8934, 913-354-1146.

List Price: \$1,595.

Requires: Amiga 2000-series computer with 3MB RAM and a hard drive, two video monitors. For use with a PC: A parallel or serial port, videographics board and/or editing software.

In Short: A first-class peripheral for embellishing video signals that happens to need an Amiga for a chassis. Some effects are better than others. Only simpler forms of planned control links to the PC are ready now.

CIRCLE 431 ON READER SERVICE CARD

gram, a still-store (for grabbing, storing, and recalling frozen video images), and a character generator (titler) that can do fixed, rolling (vertical scrolling), or crawling (horizontal scrolling) lettering with outlines and drop shadows. The provided software also includes a full 3-D modeling, animation, and rendering package.

The Video Toaster doesn't help with editing (changing the time-order of segments), and it doesn't replace more-specialized image-manipulation tools such as architectural packages with walk-through modules. Nor does the current version of the software include any auto-

matic sequencing of effects; you have to trigger each one manually or through an external input.

But these are precisely the reasons why the PC partnership is so strong. There are two basic scenarios in the PC/Amiga marriage. You can route the NTSC-style (television-standard) output of a videographics board on the PC to the Toaster input. Not only do you get the extra special effects, but since the Toaster is optimized for NTSC, the output tends to be a cleaner signal.

The reverse scenario uses the Toaster as a video source to add titles, still images, backgrounds, or other effects, but you do your editing on the PC. In this case the PC handles the control of the tape playback and record machines, and the Toaster combines the images.

Right now, the Toaster can listen for a "do it" input on a single control line that video professionals call a general purpose interface (GPI). Essentially, it senses a switch closure to ground. If you're handy with a soldering iron, cables, and you've got a spare parallel port, you can add single-step control from a PC.

A PC-based version of the Toaster board isn't likely to appear in the near future because the board needs the Amiga's custom video control chips as well as several of its own. But it's likely that in the near future, PC-to-Toaster coordination will improve. NewTek has been assessing control of most effects via the Amiga serial port using Commodore's AREXX cross-application control language. There's also a plan to make the effects controllable using MIDI instructions, which would let you order up video effects from any PC-based MIDI synchronizer program.

In sum, a PC, an Amiga, and a Toaster combination is the video production equivalent of life in the early days of desktop publishing. For a small investment, a bit of extra work, and tolerance of some idiosyncrasies, you can get most of the performance that would otherwise require tens of thousands of dollars of specialized professional equipment. ■



The Video Toaster handles digital switching between video sources and offers a panoply of special effects. Here the PC Magazine logo is keyed over rendered water.

You get **G** fonts with the Starter Kit **PLUS A FREE BONUS!**

Text Fonts

- | | |
|---|---|
| ☐ Avant Guard | ☐ Gibraltar |
| ☐ Baskerton | ☐ Jewel |
| ☐ Capelli | ☐ Joulliard |
| ☐ Century | ☐ Katrina |
| ☒ Corporate | ☐ Letter Gothic |
| ☐ Corporate Condensed | ☐ Obelisk |
| ☐ Courier | ☐ Oxford |
| ☐ Eterna | ☐ Padua |
| ☐ Futuri | ☐ Prestige |
| ☐ Garamand | ☒ Roman |
| ☐ Garamand Condensed | ☐ Souvienne |
| ☐ Gazette | ☐ Top Hat |

Decorative Fonts

- | | |
|--|--|
| ☐ Aero | ☐ Gettysburg |
| ☐ Army Black | ☐ Greek AB&f 01 |
| ☐ Bongo Black | ☐ Guthrie |
| ☐ Buckingham | ☐ Harem |
| ☐ Circus | ☐ Manuscript |
| ☐ Classic Typewriter | ☐ New York Deco |
| ☐ Copperfield | ☐ Nuts |
| ☐ Coronation Script | ☐ PENWIN |
| ☐ Dateline | ☒ Rockland |
| ☐ Dateline Condensed | ☐ University Ornate |
| ☐ Diner Script | ☐ Waldorf Script |
| ☐ Don Casual | ☒ Zingbats  |
| ☒ Exchequer Script | |

Glyphix fonts work with WordPerfect 5.0/5.1, unlike any other fonts on the market. They're simple to install and simple to use and right now we're running a special, so there couldn't be a better time to try Glyphix.

Your WordPerfect Fonts menu (Ctrl-F8) will come alive. You'll be able to select a font in any size from 3 to 120 point, and choose from effects like bold, italic, bold italic, reverse, outline or shadowed text. And each font is available in both portrait and landscape and includes a complete international character set. But here's the best news. Glyphix fonts are generated *on-the-fly*, in seconds, when you print. You don't have to do anything... just sit back and admire the results.

The Glyphix Starter Kit includes our unique font management software and the fonts checked above. And everything you need to get started is in the box. No additional printer memory or upgrade is required. If you have a standard LaserJet Plus, II, IIP or III you're in business. And DeskJet owners can use Glyphix too, with our DeskJet version. Once you have our Starter Kit you can buy additional fonts at our everyday low prices. (Text fonts- \$49.95, Decorative fonts- \$24.95)

WordPerfect Font Special

FREE BONUS

Order your Glyphix Starter Kit today and pick any font from the Glyphix collection as a **FREE BONUS!**

We're so sure you'll love Glyphix that we offer a 30-day money back guarantee. You risk nothing. If you're not completely satisfied return the software within 30 days for a full refund.

Call today and let us know the size disk you need, if you're a LaserJet or DeskJet user and your free font.

CALL TOLL-FREE.

800-237-9383



Glyphix Starter Kit (\$99.95 plus \$7 S&H for Federal Express)

Includes installation software for WordPerfect 5.0/5.1 and Roman, Corporate, Rockland, Exchequer Script and Zingbats fonts.

CIRCLE 299 ON READER SERVICE CARD

SWFTE International, Ltd
Stone Mill Office Park
724 Yorklyn Road
Hockessin, DE 19707
In Delaware 302-234-1740
FAX Orders 302-234-1760

Swifte

There is nothing in this fine print that changes our offer or dilutes our guarantee. If you are in anyway dissatisfied with Glyphix performance or quality return the software within 30 days and we'll refund your money. It's really that simple. To use Glyphix you need an IBM PC, AT, XT, PS/2 or compatible with a minimum of 512Kb RAM, a hard disk, MS-DOS 3.0 or later, a LaserJet Plus Series II, IIP, III or compatible printer with 512 Kb of printer memory or a DeskJet. WordPerfect is a trademark of WordPerfect Corporation. SWFTE, Glyphix and the font names used in this advertisement are trademarks and/or trademarks of SWFTE International Ltd. ©1990 SWFTE International Ltd.

First Looks

Forest & Trees for Windows: Data Access, Integration And Monitoring

HANDS ON
by Neil Richards

Managing a business requires the most up-to-date information. But putting together this data from all of its various sources can be difficult, time-consuming, and—most important—costly.

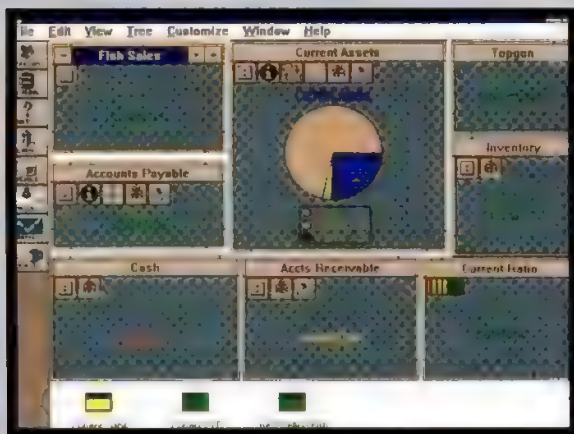
Enter *Forest & Trees for Windows*. *F&T/W* from Channel Computing acts as a front end to your data, seeking out results automatically to keep you continually informed. The program can query data from multiple data sources on a local hard disk, over a local area network, or via a gateway to a mainframe, and can consolidate the results into meaningful information. *F&T/W* is especially well suited to the production of key indicators—vital signs that help you zero in on the health of your business.

Moreover, *F&T/W* contains facilities that will automatically notify you, either visibly or audibly, when certain "alarm" conditions occur, such as "cash-on-hand" falling below a certain threshold, for example. Not only can it produce the

information, but it can also monitor the results.

F&T/W interfaces to data sources include *dBASE III Plus* and *dBASE IV*, *R:BASE*, *Paradox*, *DataEase*, *Lotus 1-2-3*, *Microsoft Excel*, and ASCII and binary flat files. Optional additional interfaces are available for *Microsoft SQL Server*, *Gupta's SQLBase*, *Oracle*, *IBM's AS/400* and *IBM DB2* (via *Gupta's SQL Gateway*). Interfaces to the *Great Plains* software and *ABM Platinum* accounting software packages are also available, each from their respective vendor. A special license interface to *Btrieve* is available for developers.

F&T/W takes advantage of the *Microsoft Windows 3.0* graphical user interface. Results are presented in resizable View windows, alarms can be made to pop-up through your *Windows* applications, and icons are used to good benefit. However, in the rush to answer customer requests for a *Windows* version of *F&T* (a DOS character-mode version has been available for a few months now), some aspects of the keyboard interface were left incomplete.



Forest & Trees can query and combine data from various sources into View and can monitor and update results.

**FACT FILE**

Forest & Trees for Windows
Channel Computing Inc., 53
Main St., Newmarket, NH
03857; 800-289-0053.
List Price: For *Windows*
standard edition, \$495; for *New
Wave* edition, \$595; for optional
LAN pack (includes interfaces
to *Microsoft SQL Server*, *Gupta
SQLBase* and *Oracle*), \$995.
Price is per server.
Requires: 2MB RAM.
In Short: An information
gatherer that supports input
from an extremely wide variety
of data sources. Very useful for
constructing a management
system for monitoring key
indicators.

CIRCLE 450 ON READER SERVICE CARD

For example, in some dialog boxes the hotkeys either do not work or do not work as expected. In other dialogs the same hotkey is used more than once, making navigation via the keyboard difficult. Suffice it to say, you'll want to use a mouse with this program.

Bringing your data on-line involves building views. A view contains all the information related to gathering and producing a result and is the basic building block of *F&T/W*. It specifies, among other things, the "provider" of the data—which can be a database, another view, or *Windows DDE* (dynamic data exchange).

You can create many views, including hidden views whose sole purpose is to gather data for a higher-level view. Not only can a view extract data from a data source, but it can combine data from other views. A view's results can be displayed in a View window, either textually or in one of seven simple graph formats.

To produce the requisite data for a view, you construct a query using SQL *SELECT* statement syntax to gather the data from the selected provider. For example, to provide the total cash-on-hand from a hypothetical database you might use "SELECT SUM(CASH) FROM CASHDB." Whenever you calculate, the view *F&T/W* goes out, gathers the data, re-constructs the result, and dis-

plays the result in the view's window.

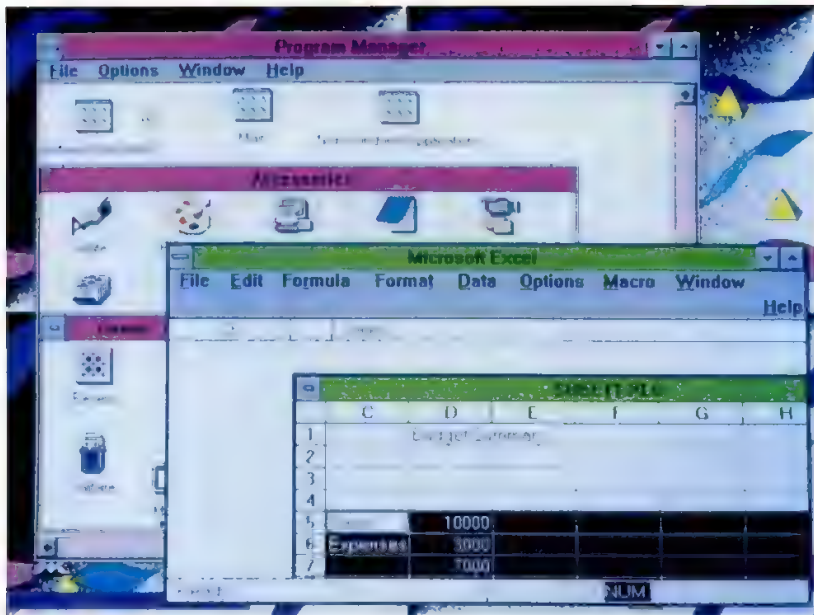
You can conceptualize the use of views as an information tree. The views on the lower branches gather data from various data sources. The views on the higher branches, and the uppermost view, combine results from the lower views. *F&T/W* can display this relationship visually so you can view the information hierarchy.

One limitation is that currently, a view can hold only a single-column result or list of results. So, while you'll find it easy to create a view that displays a single result for total sales, you'll find it difficult to create a view that displays total sales by product. Luckily, *F&T/W* includes a report writer that can produce multicolumn reports, but the procedure isn't as automatic as with views. Channel is hard at work to remove the single-column view limitation.

Since creating a view requires field-level familiarity with your data sources and an understanding of SQL syntax, a programmer or technician will likely be required. However, once the views are all set up and working, *F&T/W* can be used by most anyone comfortable using a mouse.

The value of financial information depends a great deal on its being calculated at precise intervals. *F&T/W* offers a variety of scheduling options, letting you calculate views automatically at specified intervals. Updates can also take place via a *Windows DDE* hotlink, meaning the view will be recalculated as soon as the data in the linked application is updated. As long as *F&T/W* is running, the calculation will automatically take place, even in the background. A history feature can be turned on to save the results of each calculation.

F&T/W's strength is its ability to query and combine data from such a wide variety of data sources, and its ability to automate and monitor your business's vital signs. If you're looking to keep a finger on the pulse of your business, you should consider *Forest & Trees for Windows*. ■



CM-1440: A Trinitron® tube and our enhanced technology makes Windows and all business applications cleaner, brighter, and sharper.



CM-1450: Non-interlaced 1024x768 resolution makes CAD, DTP, and business graphics brighter without flicker or ghosting. For under \$1000.

Why Cleaner Screens Brighten Windows. (And Doors)

In a word, focus. The bright, clean images on our CM-1440 and CM-1450 high-resolution screens come from the best Trinitron tubes, made even better by Seiko Instruments' precision electronics.

You see, other monitors' electron guns sometimes misalign, resulting in fuzzy, less intense color dots and slightly out of focus type. Our specially designed driving and focusing electronics are simply more precise. So our colors are always on target. And always in focus.

The result is brighter, richer color. Sharper lines. And crisper type. All of which works wonders for Windows, or any application.

Choose the CM-1440 for the sharpest images in business. Or for even crisper, flicker and ghost-free desktop publishing, graphics and CAD, pick the non-interlaced CM-1450. Both have a .25mm aperture grille (dot pitch) to sharpen the details. Of everything from Windows to doors.

Call 1-800-888-0817 Ext. 112C for dealer information and a free brochure on our entire line of precision engineered, 14" and 20" monitors for PC's and MACs.®

Model	8514/A		1024x768 Int*	1024x768 Non-Int*	640x480 MAC	1024x768 MAC
	640x480 VGA	800x600 SVGA				
CM-1440 14"	X	X	X			
CM-1450 14"	X	X	X	X		
CM-2050 20"	X	X	X	X	X	X
CM-1445 14"					X	



SII 
Seiko Instruments

MAXIMUM Power At



Ultra-Comp's new state-of-the-art headquarters. This high tech manufacturing facility is designed for maximum efficiency. Along with its new headquarters, Ultra-Comp is unveiling a new system design. The new design symbolizes the pride that goes into the manufacture of every Ultra-Comp computer. Each system is built to order and put through a series of tests and quality control procedures before it is shipped to you.

In a super-fast paced industry, the ability to anticipate the future is of utmost importance. For this reason Ultra-Comp stays pro-active, looking to the future for innovation and bringing it back to you today.

Call Toll Free

1-800-437-1988

In Missouri Call 314-991-1988

- ☒ Toll Free Lifetime Technical Support
- ☒ One Year Warranty
- ☒ 30 Day money Back Guarantee
- ☒ Leasing Options Now Available

All Ultra-Power systems include Microsoft Windows 3.0 with 630 page manual.



ULTRA-COMP

A MINIMUM Price!!!

ULTRA-POWER™

WARNING!!!

You Won't Find A More Spectacular Video Anywhere.

Ultra-Power systems feature non-interlaced SONY monitors. The difference between interlacing and non-interlacing is like night and day. Non-interlaced monitors provide a crisp, high resolution image free of flickering and shadow ghosting. We've always known the SONY 1304 is the finest monitor available and now PC Magazine agrees, awarding it the prestigious Editor's Choice award. The Sony 1304 is paired with a 16 Bit VGA card with 512K RAM (upgrade to 1MB available). The image you see will be as sharp and clear as a color print.

Outstanding Disk Performance. Superior IDE hard drives with the fastest access times around. With the 486-25 and 386-33 systems you'll get a powerful 200MB's of storage and an unbelievable 15MS access time. The 386-25 (cache) system includes 120MB's of storage and an 18MS access time. With the 386-25 (no cache) and 386-SX systems you'll get 80MB capacity and a super fast 17MS access time.

All The Memory You'll Need. 4MB RAM and a 64K static RAM cache on the 486-25, 386-33 and 386-25 systems. Or you can choose between a 386-25 with 4MB RAM and a 386-SX with 2MB RAM.

Microsoft Mouse and Windows: a Winning Team. All Ultra-Power systems now include the easy to use Microsoft Windows 3.0 and the Mouse that outperforms all the others. PLUS your choice of either MS-DOS 3.3 or 4.01.

Two Teac Floppy Drives. Two high density floppy drives: both a 5.25" and a 3.5". The Teac name is known around the world for quality and dependability.

World Class Keyboard. The Ultra-Click 101 key keyboard, recognized for its superior touch and exceptional on-the-job reliability.

Custom Configurations. If you don't see the system you need, call for custom configurations. Options: Hard drives up to 1.2 Gigabytes, uninterruptible power supplies, tape backups and laser printers. And don't forget, every system includes a 30 day money back guarantee, a one year warranty and toll free technical support. On-Site and extended warranties are also available.

ULTRA-MAX 486-25

- 64K 25NS Static RAM Cache
- 4MB RAM
- 200MB 15MS IDE Hard Drive w/ 32K Cache
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- 16 Bit VGA Card w/ 512K RAM

Lease for as low as \$178 per month*

- 14" Sony Trinitron 1024x768 Super VGA Monitor
- Microsoft Mouse and Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports

\$4495

ULTRA-MAX 386-33

- 64K 25NS Static RAM Cache
- 4MB RAM
- 200MB 15MS IDE Hard Drive w/ 32K Cache
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- 16 Bit VGA Card w/ 512K RAM

Lease for as low as \$142 per month*

- 14" Sony Trinitron 1024x768 Super VGA Monitor
- Microsoft Mouse and Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports

\$3595

ULTRA 386-25

- 64K 25NS Static RAM Cache
- 4MB RAM
- 120MB 18MS IDE Hard Drive
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- 16 Bit VGA Card w/ 512K RAM

Lease for as low as \$138 per month*

- 14" Sony Trinitron 1024x768 Super VGA Monitor
- Microsoft Mouse and Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports

\$3195

ULTRA 386-25

- 4MB RAM
- 80MB 17MS IDE Hard Drive w/ 32K Cache
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- 16 Bit VGA Card w/ 512K RAM
- 14" Sony Trinitron 1024x768 Super VGA Monitor

Lease for as low as \$111 per month*

- Page Mode Memory & Shadow Support
- Microsoft Mouse and Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports

\$2795

ULTRA 386-SX

- 2MB RAM
- 80MB 17MS IDE Hard Drive w/ 32K Cache
- 1.2MB 5.25" Floppy Drive
- 1.44MB 3.5" Floppy Drive
- 16 Bit VGA Card w/ 512K RAM
- 14" Sony Trinitron 1024x768 Super VGA Monitor

Lease for as low as \$95 per month*

- Page Mode Memory & Shadow Support
- Microsoft Mouse and Windows 3.0
- MS-DOS 4.01 or 3.3
- Ultra-Click 101 Key Keyboard
- 1 Parallel & 2 Serial Ports

\$2395

For Monochrome VGA Deduct \$500, Add \$150 For Vertical CPU Case.



ULTRA-COMP, 11988 Dorsett Rd., Maryland Heights, Missouri 63043, Fax 314-991-0437
Toll Free 1-800-437-1988 In Mo. Call 314-991-1988
MasterCard, VISA, Discover Card, personal and company checks accepted. Minimum order \$25. Customer freight and handling F.O.B. St. Louis, Mo. Non-credit card orders shipped UPS COD. Prices and specifications subject to change. Toll free technical support for customers outside of Missouri. Some systems photographed with optional extras. *Based on 36 month open-end lease.

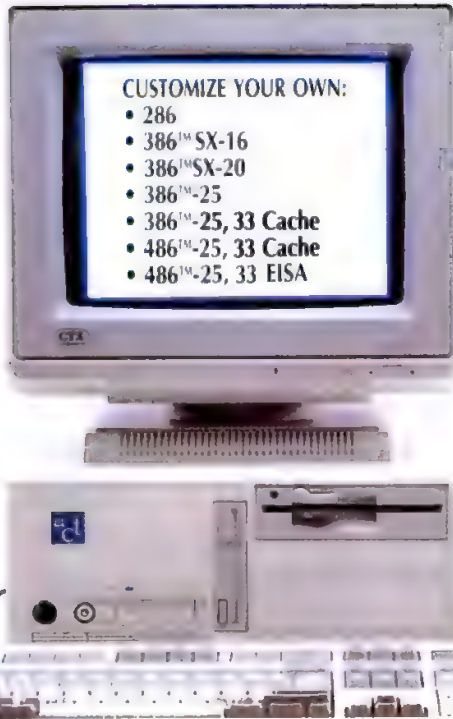
Ultra-Comp is a registered trademark and the Ultra Advantage, Ultra-Power and SX Appeal are trademarks of Ultra-Comp. IBM, PC, XT & AT are registered trademarks of International Business Machines. Microsoft and MS-DOS are registered trademarks, and Windows is a trademark of Microsoft Corporation. 386, 486 and SX are trademarks of Intel Corp. All other trademarks are registered trademarks of their respective owners. Not responsible for errors in typography.

Professional Level Performance



INDUSTRY LEADING PERFORMANCE, PRICE AND RELIABILITY

386™-33 FC Cache System



CUSTOMIZE YOUR OWN:

- 286
- 386™ SX-16
- 386™ SX-20
- 386™-25
- 386™-25, 33 Cache
- 486™-25, 33 Cache
- 486™-25, 33 EISA

ORDER YOURS TODAY FOR...

- Intel 80386 33MHz CPU
- 4MB 80ns RAM (exp. to 8MB)
- 64KB Cache Memory (exp. to 256KB)
- 1.2 MB High-Density Floppy Drive
- 1.44MB High-Density Floppy Drive
- 125MB Formatted IDE Hard Drive (19 ms)
- 2 High Speed Serial Ports and 1 Par. Port
- 8 Expansion Slots (6 available)
- 102-Key Enhanced Keyboard
- Built-in Setup and Diagnostics in ROM
- Real-Time Clock with 10-Year Battery
- 200-Watt Power Supply
- Super-VGA Monitor (1024 x 786 at .28mm d.p.)
- Super-VGA Video Card w/512 KB (expandable to 1MB)
- Microsoft DOS 4.01 or 3.3 (installed)
- Microsoft Windows 3.0 (installed)
- Microsoft Serial Mouse
- Choice of Tower or Desktop Case
- Free Delivery
- Lifetime Toll-Free Technical Support
 - TRW One-Year On-Site Warranty
 - Wide Variety of Options Available

\$3,495

complete

(Lease \$98/mo., 48 mos.) 386-25 FC price \$3,195
Non-cache model shown. Tower case available.

"ACT's 33MHz mini-tower machine is a class act all the way around. The ACT 386-33FC is a well-made machine with easy drive access, good performance, and impressive attention to construction detail. This computer is easy to recommend."



December 25, 1990

Every A.C.T.
System Features

Customized Solutions for 286, 386™ and 486™ Systems • Free TRW One-Year, On-Site Warranty • Lifetime Toll-Free Technical Support • 30-Day Money-Back Guarantee • Guaranteed 48-Hour Burn-in • Plus, Free Shipping



Automated Computer Technology Corporation

2307 Spencer Highway • Pasadena, Texas 77504
Telephone (713) 946-0731 • Fax (713) 946-3117

A.C.T. NOW Toll-Free
1-800-521-9237



Lease Terms, Qualified P.O.s Accepted
Dealer and VAR inquiries Welcomed

© 1990 Automated Computer Technology Corporation. All rights reserved. Other product names and trademarks used for comparison may be the property of other companies. Prices and specifications are subject to change without notice. A.C.T. cannot be held responsible for errors in photography or typography. The equipment above is FCC Class A approved. DELL, NEC, NORTHGATE and TRW are all trademarks of their respective corporations. TRW on-site service is available in most U.S. locations. The numbers 386 and 486 are trademarks of Intel Corporation. MAN/054205

CIRCLE 476 ON READER SERVICE CARD

First Looks

Two New Inkjet Printers For Graphics and Text

Color 4 from Kodak Surpasses HP's PaintJet in Output Quality and Paper Handling

HANDS ON
by Matthew J. Flans

Color output has become increasingly desirable. So far there are three ways to get there: color dot matrix with its low-quality output, thermal transfer involving costly supplies and special paper, and color ink jet—notably, Hewlett-Packard's PaintJet line.

Now there's Eastman Kodak's new color ink jet printer—the \$1,495 Kodak Diconix Color 4—which should cause a stir in the ink jet segment of the color printer market with its aggressive pricing, flexible paper handling, and strong output performance.

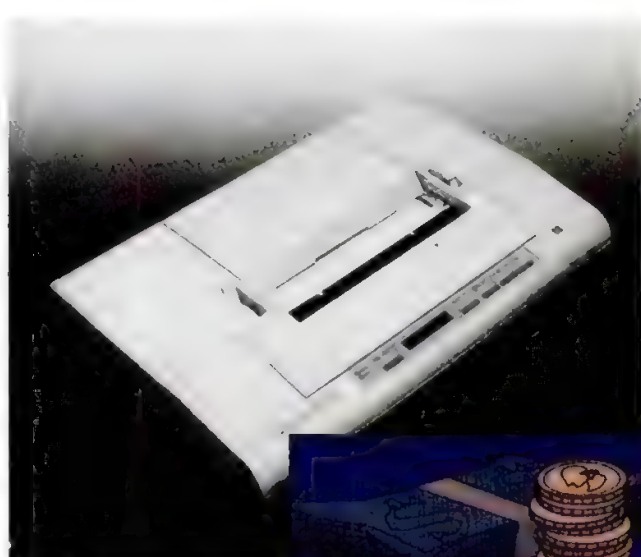
The Color 4 falls between the \$1,395 PaintJet and the more costly PaintJet XL in price and performance. Unlike the PaintJet, which supports only continuous-feed paper, the Color 4 supports both standard continuous-feed and cut-sheet paper, as well as ink jet transparencies.

A built-in paper tray on the Color 4 can hold up to 60 sheets of plain paper. In order to switch quickly between continuous feed and cut sheet paper, you merely have to throw the printer off-line, and take the continuous feed/cut sheet toggle lever. The \$2,495 PaintJet XL also supports continuous and cut sheet paper, and can print up to 11- by 17-inch (B-sized) pages. Kodak's 8-inch print carriage accepts only 8.5- by 11-inch paper, with an 0.25-inch margin on each side of the page.

Kodak's color printer features four separate ink cartridges: cyan, magenta, yellow, and black. Like other quality ink jet printers, the printhead replete with ink jet nozzles is re-

placed each time you install a new ink cartridge. This results in consistent output over the life of the printer, and lower maintenance requirements. Replacement cartridges are reasonably priced: \$13.95 for black ink and \$19.95 for color cartridges.

While the Color 4 uses separate color cartridges, HP's PaintJet, in contrast, features a three-color (cyan, yellow, magenta) cartridge and a second black ink cartridge. The Color 4's scheme is clearly advantageous since you only replace ink when necessary, and none gets wasted. Another benefit of non-impact printers like the Color 4 are their quiet performance, especially in office settings. Ko-



The slimline Color 4 produces vivid color output on plain paper, as demonstrated by this graphic printed from Microsoft PowerPoint.



dak lists the Color 4's noise level at a quiet 45 decibels.

Setup is quick and relatively painless. The four printhead cartridges install quickly; the only tool necessary is a paper

clip to prime the cartridges. The printer requires a Centronics parallel interface cable.

The Color 4 is sleek, featuring a slimline design that mea-

CONTINUES ON PAGE 44

Canon's Wide-Carriage BJ-330: Quiet, Quick, and High Quality

HANDS ON
by Bruce Brown

Computer and peripheral companies usually introduce desktop models first, portables later. In a break with tradition, Canon USA introduced its 4 pound BJ-10e portable printer during the summer of 1990 (Editors' Choice, Ink Jet printers, November 13, 1990) followed by two desktop-only models, the narrow-carriage BJ-300 and wide-carriage BJ-330.

The wide-carriage BJ-330 we tested proved to be an interesting alternative to both 24-pin dot matrix printers and low-end laser page printers. Both the BJ-330 and the narrow-carriage BJ-300 are in direct competition with the Hewlett-Packard DeskJet series.

By and large, the Canon printers offer faster output times, comparable print quality,

and emulations that position them more directly as dot matrix printer replacements than the DeskJet series, which is clearly intended to be a low-cost laser printer alternative.

The Canon BJ-330 lists for \$949 (the narrow-carriage 300 sells for \$799) including one ink cartridge, with internal single sheet and continuous forms paper-handling capabilities. A single bin automatic sheet feeder sells for \$150 with a second bin option for an additional \$129. The BJ-330 comes with a standard parallel interface but a \$119 serial interface board is available.

The BJ-330's jet nozzle print mechanism uses 64 nozzles on the ink cartridge to print at a maximum of 360-dot-per-inch density. The dot matrix is 36 by 48 in high-quality mode and 18 by 48 in high-speed mode. Print quality is dark and very clear,

though in text mode the edges fall short of laser quality print.

Setup for the BJ-330 is fairly simple—the ink cartridge plugs into a compartment on the lower left front of the case. The ink cartridges are rated to last for approximately one million characters in high-quality mode, two million in draft mode. Replacement cartridges cost \$28. The ink is slightly water-soluble, even after drying for a week. Both my hands and the printer suffered from a moderate amount of ink smudging while I assembled the unit, but once the printer was up and running, there was no further smudging.

The BJ-330 is deceptively quiet. The print head moves back and forth so quietly that you wait for the first lines of print to appear before you are assured that the printer is indeed functioning.

There are several ways to feed paper into the BJ-330. You

CONTINUES ON PAGE 44

First Looks

Diconix

CONTINUED FROM PAGE 43

sures 4 by 20 by 13.7 inches (HWD), although the paper tray when full extends from the back an additional two inches. The unit weighs 13 pounds. The front panel is clearly labeled, with a 16-character LCD, which can display error messages and menu choices in four languages: English, French, German, and Spanish.

Kodak lists the printer's specifications as 150 characters per second in draft mode, but clearly, the Color 4 is not designed as a text printer. It has only three built-in fonts supported in hardware: Prestige 10, Prestige 12, and Gothic 18, each supported in draft, near-

letter-quality, and quality print modes. In addition, while bold and underline fonts are supported, compressed, italics, superscript, and subscript are not.

Text output is reasonable, but has a tendency to bleed. It is not nearly as sharp as the output from noncolor ink jet printers, such as the Canon BubbleJet line. To its credit, once dry, Kodak's inks are far more resistant to smearing, and unlike water-based inks, the Color 4's are almost completely water-resistant.

The Color 4's output is brighter and livelier than the PaintJet, which costs \$100 less. And the unit's 192-by-192 dot-per-inch resolution, and print-heads featuring a 12-jet vertical array with 1/96-inch pitch produce crisp output. Reds, yellows, and blues are much more vivid than on a PaintJet. The

Color 4's one drawback was a generous amount of red in its blue output, pushing blues closer to purple.

The Color 4 lagged slightly behind the PaintJet on PC Magazine Labs Graphics Speed performance test for printers. The PaintJet produces 1.2 graphic pages per minute, compared to the Color 4's 1.1 ppm. The test was performed using a *Page-Maker* file printed with the Color 4's own *Microsoft Windows* 3.0 printer driver.

The Color 4 also features PaintJet emulation on a personality card that inserts at the back of the printer. Unfortunately, as of this writing there are no Epson or IBM Proprinter emulations available for the unit. And while there is a second personality card slot present on the machine, Kodak has not announced any further emulations

to date.

The Kodak Diconix Color 4 distinguishes itself as a solid color printer for those looking to produce color transparencies and handouts and proof/check color slides and other color output before production. The Color 4 features superior performance over the PaintJet, and while it lacks some of the features of the PaintJet XL, most notably B-sized paper handling, the Color 4's aggressive list price makes it worth serious consideration as a moderate-cost color ink jet printer. ■

List Price: Kodak Diconix Color 4 printer, \$1,495. Replacement printheads, \$13.95 (black) and \$19.95 (cyan, magenta, or yellow). Eastman Kodak Co., Personal Printer Products, 901 Elmgrove Rd., Rochester, NY 14653; 800-344-0006.

CIRCLE 700 ON READER SERVICE CARD

BJ-330

CONTINUED FROM PAGE 43

can load single sheets manually through a slot in the front, use the built-in tractor feed with automatic paper loading for continuous sheets, or use the optional sheet feeder. The printer has a paper-parking feature and fanfold paper can range from 4 to 16 inches wide.

You don't need to use clay-coated paper with the BJ-330; plain paper works fine. I experienced occasional smearing while running our PC Magazine Labs Printer Performance Tests, which ejected test result report sheets very quickly. But, in general, when printing from applications, the output was smear-free.

The BJ-330 has a front control panel for choosing typeface and pitch. There's also a button to manually clean the printhead, although this process also occurs automatically. Standard internal typefaces include Courier, Prestige, and Gothic with pitch options for 10, 12, 15, 17, and 20 characters per inch, plus proportional spacing. Optional font cards for General, OCR, and Modern fonts are available for \$99 each.

The printer can emulate either an Epson LQ-1050 or IBM Proprinter XL24E; the emula-

tion choice is set via DIP switches located in back of the printer that can be changed without opening the printer's case.

Our performance tests showed the BJ-330 to be a reasonably fast printer that was significantly faster in Epson mode than in IBM mode. Graphics printed in Epson mode were also noticeably darker and clearer than those printed in IBM mode. Thus, it would seem that the Epson mode should be the mode of choice except if you need to print the IBM-compatible high-bit ASCII character set.

A comparison with the HP DeskJet 500 reveals the different orientations of the two lines. The DeskJet 500 comes standard with HP LaserJet Plus emulation; optional IBM Proprinter and Epson FX-80 emulation cartridges are also available for \$79 each.

The Canon Bubble Jet printers do not include HP LaserJet emulation, either standard or as an option. The DeskJet has more standard fonts plus landscape mode, but doesn't offer the range of pitch sizes you get with the BJ-330 and BJ-300. The \$799 narrow-carriage BJ-300 costs a little more than the \$749 HP DeskJet 500; and



Canon's 19.4-pound BJ-330 uses 64 ink jet nozzles to produce high-quality text, quietly. Its

Epson emulation produces output that is crisp and dark, but IBM mode is not as inviting.

there's no wide-carriage version of the DeskJet 500.

Based on their emulation strategy, and with their quiet operation, good speed, and high-quality print, the Canon BJ-330 and 300 printers are best seen as alternatives to 24-pin

dot matrix printers. ■

List Price: Canon BJ-330, \$949. Canon BJ-300, \$799. Replacement cartridges, \$28. Canon USA Inc. One Canon Plaza, Lake Success, NY 11042; 516-488-6700.

CIRCLE 446 ON READER SERVICE CARD



THE WINDOWS™ 3.0 SOLUTION: Microway's FASTCache-SX™ replaces your Intel® 286™ with a 386™SX that triples your speed for just \$495!

FASTCache-SX is your most cost effective upgrade path to the world of 386-based computing. Designed to work in most ATs and compatibles, Microway's FASTCache-SX converts your 286 into a true 386SX powerhouse that outperforms all 386SX-based systems we've tested to date. You'll be able to run all your old 16-bit software plus new applications customized for the 386's speed and 32-bit memory, like Windows 3.0 in "386 enhanced mode." And, it's 100% compatible with your AT's hardware and software.

Speed ... Memory ... Compatibility

Its large, four-way set associative cache gives your AT zero-wait-state performance accessing 16-bit memory. Most of your

- Features a genuine Intel 80386SX running at either 16 or 20 MHz.
- Quick and easy installation with our user friendly manual.
- Includes state-of-the-art four-way set associative 32K cache (optional 64K).
- Runs Windows 3.0 in "386 enhanced mode," DESQview-386, and OS/2.
- Landmark ratings of 21.3/27 MHz and Norton SI ratings of 18/22.4 at clock frequencies of 16/20 MHz.
- Outperforms all other 386SX-based motherboards and accelerators!
- Running with an optional Intel 80387™SX, FASTCache-SX delivers 5 to 10 times the numeric throughput of your old AT—up to 1.7 MegaWhetstones—making it ideal for boosting the speed of AutoCAD, Lotus 1-2-3, and PostScript interpreters such as Freedom of Press.

applications will run two or three times faster, providing the equivalent performance of more expensive 386/387DX-based systems. FASTCache-SX/16 gives you the power to run 386-specific multitasking programs on your AT or compatible for just \$495, plus cable! FASTCache-PLUS (available in January) includes 8 megabytes of extended memory.

No Risk Offer: FASTCache-SX comes with an unconditional, 30-day, money back guarantee and a 5 year warranty. Your complete satisfaction is guaranteed — or your money back!

Call (508)746-7341 to order your FASTCache-SX today!



Microway®

Corporate Headquarters,
P. O. Box 79, Kingston, MA 02364 USA
TEL 508-746-7341 • FAX 508-746-4678

U.K. 32 High St., Kingston-Upon-Thames, 081-541-5466
Norway 9 876656
Holland 40 836455
Italy 02-74.90.749
Japan 81 3 222 0544

286, 386, 387 are trademarks of Intel Corp.
Windows is a trademark of Microsoft.
FASTCache and Microway are trademarks of Microway, Inc.

First Looks

ReadyLINK: Low-Cost, Entry Level DOS-based LAN

HANDS ON
by Kimberly Maxwell

Compex's *ReadyLINK* joins the ranks of products such as Artisoft's *LANtastic*, D-Link Systems' *LANsmart*, Invisible Software's *Invisible Ethernet NET/30*, and U.S. Sage's *MainLAN* in the peer-to-peer, entry level, DOS LAN competition.

ReadyLINK offers users everything they need in a network operating system for under \$130 per node, based on a 10-node system. Users can send and receive messages and share network devices from either the DOS command line or from a menu, as well as share drives. You can run *ReadyLINK* under *Microsoft Windows 3.0* in real and standard modes, but it won't load in *Windows* enhanced mode.

An important feature of *ReadyLINK* is the ability to let organizations start networking with a small investment and then switch to Novell's *NetWare* operating system without throwing away their hardware. Compex bundles *NetWare 286* and *386* drivers with the Ethernet adapters in the *ReadyLINK* package, so you get the *ReadyLINK* capability for the same price (or less) than you would pay for Novell-compatible network interface cards.

The *ReadyLINK* Ethernet network startup kit lists for \$699. Each package includes two Compex Ethernet cards, cables, operating system software for up to 255 users, and network drivers. The network operating system software is also available separately for \$299 and the Ethernet adapter boards sell separately for \$199 each. A less-expensive starter kit using ARCnet network adapters sells for a low \$499.

Compex promotes a unique configuration scheme for connecting two workgroups running different network operating systems through one

workstation by installing two network adapter cards in that workstation. The station acts as a drop-off point for data. Thus, you can download data from the Novell network onto the workstation's hard drive and have those machines on the smaller *ReadyLINK* network access the data from that drive.

You can configure each machine on the *ReadyLINK* network as a dedicated server, a nondedicated server, or as a plain-vanilla workstation. Once you decide the type of machine you want to run, you install the network cards, attach the cables, and install the network drivers and the NOS software. The installation process is similar to that of almost all DOS LANs. However, if you have any installation or usage difficulties, you'll find the manual lacks some detail.

ReadyLINK's memory requirements vary, depending on the machine's setup. A minimum configuration for the server station includes NetBIOS, Hook, Memory, Reader, and

BENCHMARK TESTS: READYLINK

While *ReadyLINK* and *LANtastic* perform similarly "out of the box," we optimized *LANtastic*'s performance to be nearly four times as fast as *ReadyLINK*'s. *ReadyLINK* has no optimization features.

The Hard Disk Access Load test heavily loads the hard disk and disk caching system. Each load station randomly accesses its own 100K data file using 1K records while the timed station transfers files. This procedure tests how well the software handles the drive and the speed of the disk subsystem.

Product Name	Hard Disk Access Load	
	No Load Station	One Load Station
LANtastic	2.67	2.37
ReadyLINK	.69	.67
Throughput in megabits per second		



FACT FILE

ReadyLINK

Compex Inc., 4055 E. La Palma, Unit C, Anaheim, CA 92807; 714-630-7302.

List Price: \$699 for Ethernet starter pack (which includes two Ethernet cards, cabling, software, and drivers).

Requires: 256K RAM, DOS 3.0 or later.

In Short: *ReadyLINK* offers an economical and effective entry level network solution although it lacks the polish and options of *LANtastic*. Because it's packaged with *NetWare* drivers for its Ethernet boards, *ReadyLINK* offers an easy step up to Novell systems.

CIRCLE 448 ON READER SERVICE CARD

The menu system eschews the traditional pull-down structure and is not as friendly as the menus in competing products, like *LANtastic* and *MainLAN*.

LANtastic's e-mail capabilities are also superior to *ReadyLINK*'s. Artisoft's product (reviewed in "Making Do With DOS," May 29, 1990) offers a voice-chat feature as well as the ability to talk with another network user over data wires using a handset or speaker box. *ReadyLINK* provides only send and receive capabilities and lacks frills such as group messaging. If you don't specify whether you want to save a message to disk file or printer, the message is automatically cleared from memory.

ReadyLINK boasts strong security options. You can configure your machine as a dedicated server, so others can't access your hard drive's directories or subdirectories. It also offers password protection or privilege rights on directories, subdirectories, or files. Some additional options, for example, controlling user log-on times, would be helpful.

ReadyLINK's benchmark performance is typical of the class. We ran the *PC Magazine* LAN Labs performance tests on a small network with a dedicated server and two client PCs. We configured the server software for dedicated server operation instead of a shared server and workstation. The *ReadyLINK* network consistently provided throughput of about 700 to 800 kilobits per second. The software includes no major configuration options to improve performance. Using the same PCs, we were able to adjust *LANtastic*'s performance parameters to produce throughput in the 2,300- to 2,800-kilobit-per-second range.

ReadyLINK doesn't have *LANtastic*'s overall ease of use, requires more RAM, and lacks some of the interesting bells and whistles such as integrated sound. Artisoft also recently lowered *LANtastic*'s price to \$299 per node. Still, *ReadyLINK* is an effective and economical system whose greatest asset is the ability to grow into a Novell network. ■

Decisions, decisions. Should you choose PCs based on stand-alone performance or network potential? Compatibility with today's standards or adaptability for the future? Power or price? Form or function?

Now, Wyse makes your PC decision easy. With the Wyse Decision PCs. An all-new line designed from the ground up with the flexibility you need for the 90s. They combine superior performance and reliability with features that allow easy networking and expansion. Which makes them Decisions both end users and MIS directors can agree on. Consider our flagship EISA-based Decision 486/33E tower. With its 64-bit Wyse Wyde-Bus, 128KB cache memory, 9 EISA expansion slots and 6 drive bays, it can be configured as a powerful CAD/CAM or engineering workstation. Or as a server supporting up to 60 users.

THE WORLD IS GETTING WYSE.

Similarly, our small-footprint Decision 386sx/16s packs a lot of versatility into its slim, 3" profile. It can be used as a diskless network node, or configured as a full-featured desktop PC to run thousands of popular applications. With integrated Super VGA, mouse, serial and parallel ports, and a 3½" disk drive. The Decision line, including 486 and 386sx desktop models, affirms Wyse's leadership in delivering advanced systems technology at affordable prices. Along with the sleek styling and ergonomics that are a Wyse trademark. So, for a Decision you can live with long-term, call 1-800-438-9973. When you compare the specs and prices, we're sure you'll agree: a Wyse Decision is indeed a... well, you know.

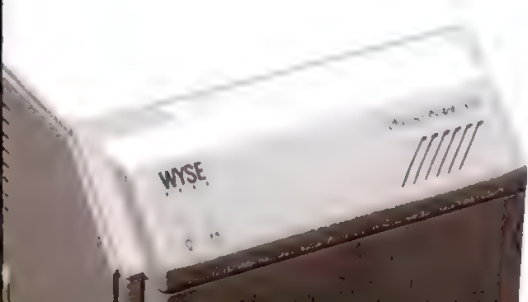


**When we saw
where computing was going,
we made some Wyse Decisions.**

WYSE

1 800 GET WYSE

CIRCLE 112 ON READER SERVICE CARD



WYSE is a registered trademark and WYSE DECISION 386sx/16s, Wyse Wyde-Bus, and WYSE DECISION 486/33E are trademarks of Wyse Technology Inc. 80386 and i486 are trademarks of Intel Corporation.

First Looks

Cumulus GLC/SBS: A Survival Kit for the Home Office

HANDS ON
by Jonathan Matz

When *PC Magazine* reviewed "home PCs" in a recent After Hours special section (January 15, 1990), we only told you half the story. PCs like the HeadStart 500CD and the IBM PS/1 are not designed primarily for businesses, which is fine for many potential home-PC users. But what about the growing number of home-based professionals and small businesses that need a PC equipped to meet the needs of the home office?

These people need sophisticated telecommunications as a part of their home business toolkit. They also need a graphical environment suited to high-powered business software. The GLC/SBS (Great Little Computer/Small Business System) from Cumulus Corp. combines both of these elements in an affordable computer package. The machine offers plenty of PC power for today, plus the expandability necessary to keep up with a professional's growing needs.

A 16-MHz 80386SX-based system, the GLC is housed in a very compact 4- by 16.25- by 16.5-inch (HWD) case. This slimline case is identical to the one that Northgate uses in its small-footprint series, but that's where the resemblance ends. Cumulus says that the entire system was designed from scratch and manufactured in the U.S. The company sells the system through major retail outlets such as Sears, ComputerLand, Microage, and Intelligent Electronics.

To meet the communications needs of the home businessperson, Cumulus includes a combination modem/fax/voice-mail add-in card which it has dubbed the "VDF" or voice-data-fax board. The VDF offers Group III fax compatibility

(both send and receive), a multiuser phone mail system, and standard 2,400-bps modem functionality, all in a single expansion slot. The VDF supports up to two phone lines, but can be used with a single line.

When operating as a single-line system, the VDF cannot distinguish between incoming fax and voice transmissions. Cumulus recommends the purchase of a third-party external switching device to solve this problem. While these devices are inexpensive and widely available, it seems a little petty not to include one, at least as an option, with the GLC. Many budding tycoons will begin with only one phone line, after all.

Fax transactions are controlled by a software package called *Fax Manager*, which can be run either from DOS or by clicking on its icon in the *Windows* 3.0 program manager. *Windows* is included with the GLC, as are *Microsoft Works*, DOS 4.01, and a CompuServe signup kit with a \$25 usage credit.

Fax Manager provides plenty of basic fax functionality, including a scheduler for unattended transmission, a log of fax transactions, and a viewer that lets you eyeball faxes be-

fore printing or sending them. The interface, unfortunately, is completely character-based, and looks quite primitive compared to *Windows* or even *Works*. Cumulus reports that a true *Windows* application to control the fax board is under development, and will be ready shortly. Users who got the character-based version will be able to upgrade at no charge.

The phone-mail system operates via your phone handset, and uses spoken menus in much the same way that sophisticated office systems do. By entering a three-digit code, any one of up to 32 users can access a private mailbox, review or delete messages, or change the outgoing message. Callers can leave a message for a specific user by entering the appropriate code, or access a common mailbox without entering a code.

Only one outgoing message



The GLC supplies essential home-office tools: 80386SX power, plus sophisticated telecommunications.

FACT FILE

Cumulus GLC/SBS

Cumulus Computer Corp.,
23500 Mercantile Rd.,
Cleveland, OH 44122; 216-
464-2211.

List Price: With 100MB hard disk, 2MB RAM, color monitor, \$2,495. With 40MB hard disk, 2MB RAM, monochrome monitor, \$1,895. Other configurations available.

In Short: The Cumulus GLC/SBS is an excellent solution for the home business user who needs a solid, upgradable PC platform with versatile communications capabilities.

CIRCLE 701 ON READER SERVICE CARD

is supported; multiple users can't create personal outgoing messages. But the general outgoing message can be easily customized, and can include a listing of the mailbox codes for particular users.

Cumulus has gone to great lengths to make the GLC an upgradable system. The processor resides on a card, and can be swapped out in favor of a true 32-bit 80386DX chip; a 486 upgrade is also on the way.

During the first year of ownership, users can apply 50 percent of the value of the SX CPU toward an upgrade. During the second year, the old chip brings 25 percent of its original value, and in the third year it's still worth 10 percent of its price toward a CPU upgrade. The motherboard-mounted VGA graphics adapter can be upgraded to 1,024-by-768 resolution for \$70.

Even when loaded with options, the GLC has room to grow. Our evaluation unit, with the VDF board, a 100MB hard disk, and a single 3.5-inch floppy installed, still had two full-length and one three-quarter length slots available, as well as two half-height drive bays.

So far, so good, but the GLC is missing one significant option: a CD-ROM drive. With the growing number of powerful business applications appearing on these shiny little wonders, a ROM drive is fast becoming an important storage option. Cumulus says that a CD-ROM drive for the GLC is under development.

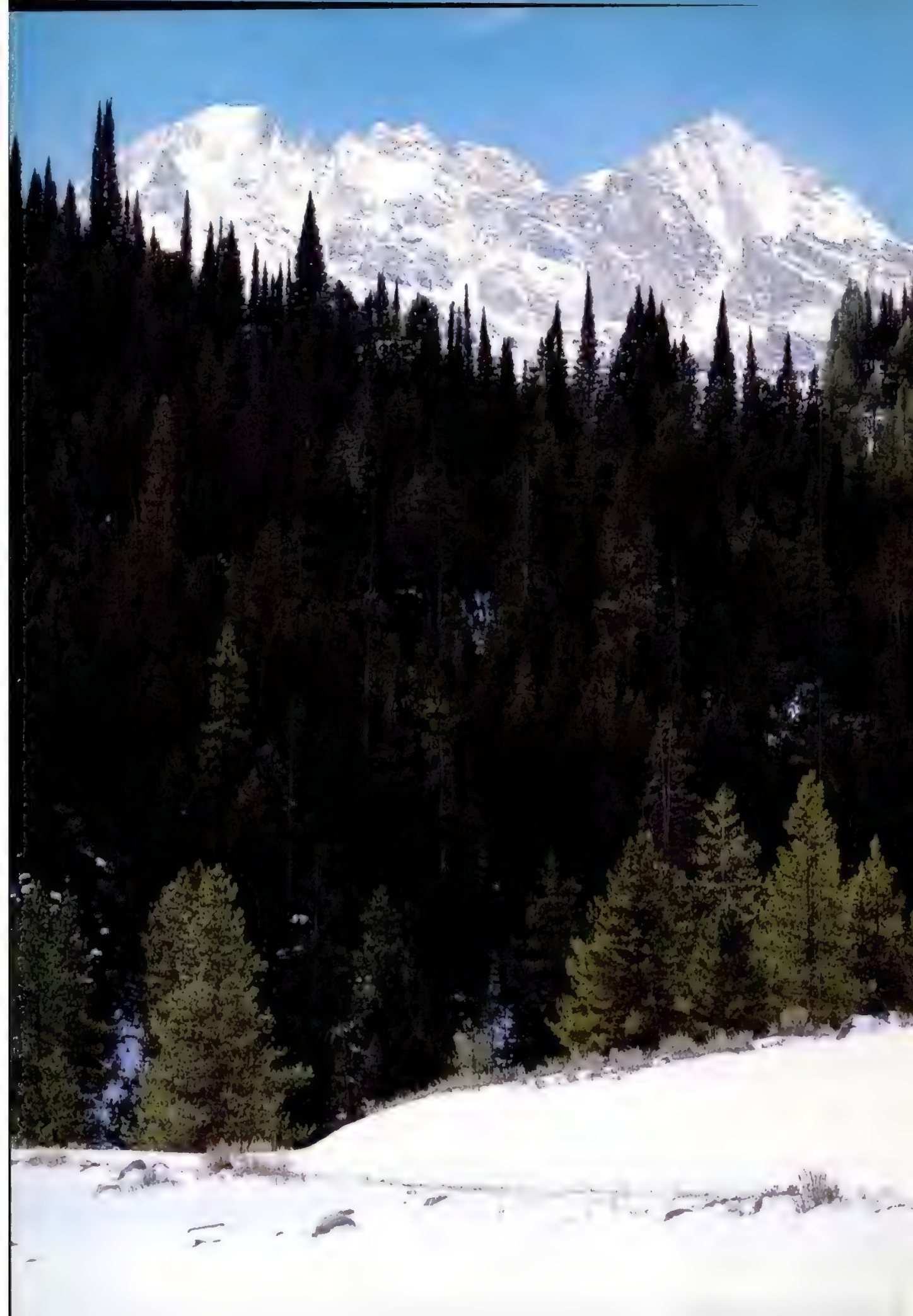
Nascent captains of industry will undoubtedly appreciate the GLC's aggressive pricing scheme. With the 100MB hard disk, 2MB RAM, the VDF, and a color monitor, the GLC has a list price of \$2,495. At the entry level, with a 40MB hard disk, 2MB RAM, the VDF, and a monochrome monitor, the price is a very affordable \$1,895. Dropping the VDF pulls the price down another \$200.

With its well-chosen and implemented features, compact dimensions, and upgrade potential, the Cumulus GLC/SBS merits a hard look from anyone who works at home. Great little computer, indeed. ■

Through Blinding Snow...



"You've got a friend in the business."



'Round Icy Curves...



To Great Lengths Gateway!

All You Have To Do

12MHz 286VGA

- 80286-12 Processor
- 1 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 112K
- 14" Gateway Crystal Scan H24 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.0

\$1495.00

25MHz 386CACHE

- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 1 MB
- 14" Gateway Crystal Scan H24 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.0
- MS WINDOWS 1.0

\$2695.00

BEST BUY

- Same features as our 33 MHz M6 VGA system except this machine has an 80 MB 17ms IDE Drive instead of the 200 MB 15ms IDE Drive.

\$2795.00

GATEWAY

- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 8ms IDE Drive with 32K Cache
- 16 Bit VGA
- 14" Gateway Crystal Scan H24 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.0
- MS WINDOWS 1.0

\$1895.00

33MHz

- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Cache
- 16 Bit VGA
- 14" Gateway Crystal Scan H24 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.0
- MS WINDOWS 1.0

\$3195.00

STANDARD

- Microsoft Windows 1.0 with all 386 features
- 30-day money back guarantee
- One-year warranty
- New business class pricing
- Toll-free technical support
- All the features of the machine

NEW

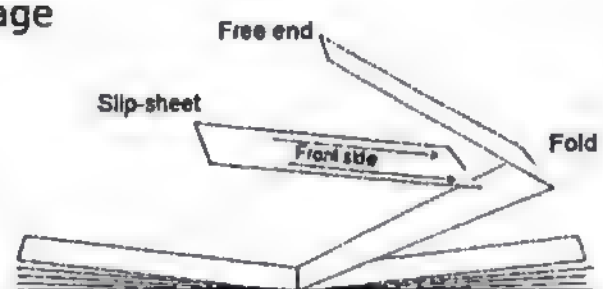
- Our new 14" Gateway Crystal Scan H24 Color VGA Monitor
- 16 Bit VGA
- 16 Bit DX



800-5

610 Gateway Drive • W. Valley Forge, PA 19381

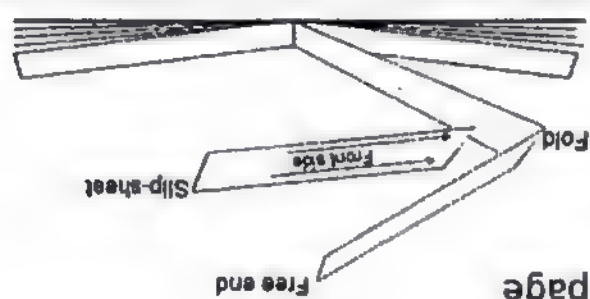
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

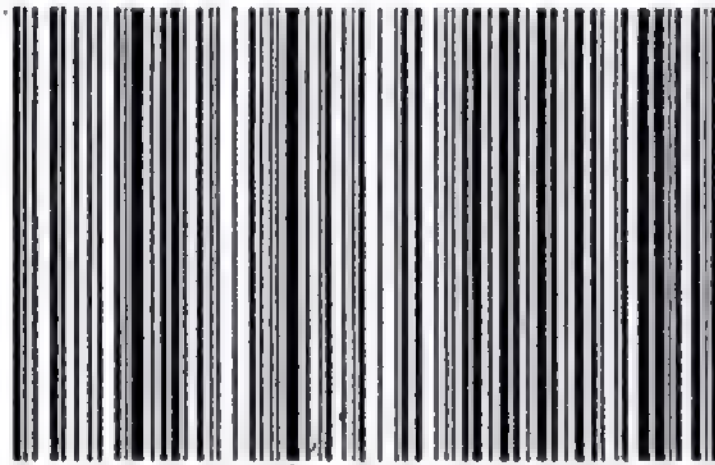


1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-001B

Back

1. Follow instructions on the other side

Some People Go
To Get A



Gateway 2000 Assurances

Like most companies, Gateway 2000 offers a good written guarantee and warranty on all products. Unlike most companies, we treat each customer as an individual, taking special care to see that your individual situation is handled fairly. Your satisfaction is our number one priority.

30-Day Money-Back Guarantee

If you're unhappy with your Gateway 2000 purchase, for any reason, you can return the system within 30 days for a full refund.

One-Year Warranty

Every Gateway 2000 system comes with a one-year warranty on parts and service. If a part needs to be replaced, we'll quickly send a replacement part via overnight shipping free of charge. Beyond the warranty, we provide free telephone technical support for the life of your machine.

Free On-Site Service

If unusual difficulties occur, we can provide free on-site service to most locations in the country.

Credit Terms

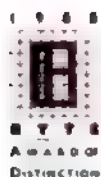
You can purchase your Gateway 2000 system on C.O.D. terms or with American Express, Discover, Visa, or Mastercard. Net 30-day credit terms and leasing options are also available to qualified buyers.

New FCC Lab, and Product Development Expansion

As an added assurance to you that your Gateway 2000 system will comply with all FCC certification requirements, we've just installed a new FCC testing lab in our recently expanded 75,000 square-foot manufacturing facility. We've also expanded our product development lab in which we continually test new components for performance, reliability, and compatibility. The quest for even better price/performance computer systems never ends at Gateway.

New Sales Hours

For your convenience, we've expanded our sales hours. New sales hours are from 7 a.m. to 10 p.m. (CST) Monday through Friday and 9 a.m. to 4 p.m. Saturdays.



8 0 0 - 5 2 3 - 2 0 0 0

610 Gateway Drive • N. Sioux City, SD 57049 • 605-232-2000 • Fax 605-232-2023

WinFax Brings Windows' Benefits To Fax Transmission

HANDS ON
by Alfred Poor

Delrina Technology's *WinFax* is one of those small software miracles that does one thing really well: It makes sending a fax as easy as printing from your printer. The best part is that it carries a miraculously small list price of \$69.

Certain products make it easy to receive faxes on your laser printer but don't offer a way to transmit better faxes. You can either print to a printer, and feed them through a balky standalone fax, or convert your output to some graphics file format that eats up disk space before getting sent via a fax board.

Or you can use *WinFax*.

If you are already using *Windows 3.0* (and have a supported fax board), all you have to do is install the program. It immediately appears in your Printer Setup menu as an installed printer. Next you create your document and print it. A window will pop up and let you enter a phone number or select one you have already stored in the program's phone directory.

You can transmit directly or save the document, and assemble a longer, multisource transmission. For instance, you could include a fax cover sheet created in one program, a chart from another, and a spreadsheet from yet another. The page header can show items like date and time, and how many pages are in the transmission—all options available when you define the *WinFax* page layout.

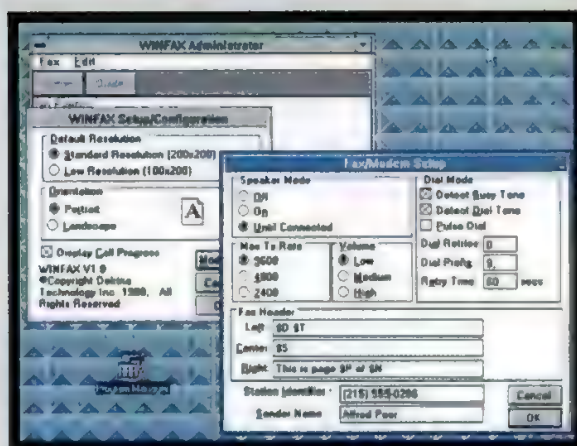
WinFax maintains a phone book of numbers, so you can select the recipient, or group of recipients, with a point and a click. You also get a log of all transmissions.

Coupled with the benefits of using *Windows*, it's easy to see *WinFax*'s power. In testing, I used the *Windows* Clipboard to move a graphic from *Paintbrush* to a *Write* document. And since the output goes straight to a 200-

dot-per-inch image file, the document is received at the other end with a sharper image than any standalone fax scanner can achieve. Even 5-point text was legible in our tests. You will probably want to get *Adobe Type Manager* to manage screen and soft fonts; some font-on-the-fly products do not work well with *WinFax*.

WinFax supports only fax boards using the Sierra Semiconductor Sendfax chip set, such as the Zoom Telephonics and Cardinal. Delrina representatives expect that you will soon be able to buy *WinFax* bundled with a board for less than \$150.

If you want to make sending faxes as easy as printing to a laser printer, grab a copy of *Win-*



Using *WinFax* is just like printing to any *Windows*-supported printer. The configuration menu offers options including the fax modem settings and the page headers.

Fax. PC fax transmissions are finally as easy as they should have been all along.

List Price: *WinFax*, \$69.

Requires: *Windows 3.0*; send-only fax board based on Sierra

Semiconductor Sendfax chip set. Delrina Technology Inc., 15495 Los Gatos Blvd., #8 Los Gatos, CA 95032; 800-268-6082 (7:30 A.M. to 5:00 P.M. PST).

CIRCLE 432 ON READER SERVICE CARD

\$149 AutoWord Converts Text and Graphics

HANDS ON
by Ed Perratore

Text conversion packages should be able to recognize and translate formatting codes that standard word processor import and export facilities cannot handle. Thus far, *AutoWord*, \$149 from White Crane Systems, offers a good argument to save your money and take your chances on your word processor's built-in conversions. The conversions it performs are not especially impressive.

To its credit, *AutoWord* offers some attractive, easy-to-use menuing features. The program allows hotkey or mouse-click access to view most text and graphics files, and it lets you select file input and output, perform swift conversions, and print to a limited number of printers.

In addition to supporting 23 word processor formats, *AutoWord* will also convert a text file to *Lotus 1-2-3* format (Version 2.01 and earlier), but not vice versa. Graphics file conversions include bitmapped .PCX, .TIF, .MAC, .MSP, and

.WPG files.

And format translations include simple, smart, stripped, and *Ventura ASCII*. The last of these inserts codes like "" for boldface that *Ventura Publisher* can interpret. For speedy conversions, you can run *AutoWord* from the command line or from within batch files.

Our test document, created using *WordPerfect 4.2*, included all the features the program claims to support—headers and footers, a footnote, super- and subscripts, a hard page break, bold and underlined text, and justification on/off. Understandably, certain output formats do not necessarily support all these features. Unsupported features can be noted in the output file, ignored, or saved to a separate exception file.

By and large, however, *AutoWord* had some trouble with every single output format. It performed best when converting *WordPerfect 4.2* to 5.0, although it dropped the footnote and misaligned one row of a four-line table.

Conversion to *XyWrite III*

also produced good, but not perfect, results. Practically every output file—formats including *Microsoft Word*, *Ami*, and *WordStar*—properly converted the source file's boldface, underline, indent-paragraph, and bold-underline codes. But typically the conversion dropped the headers and footers, flush-right code, switches to double-spaced text, all super- and subscripting, and other codes.

White Crane delayed shipping this version of *AutoWord*, having aborted the program's initial release shortly after shipping. At the time of this review, the vendor hoped to have the program's remaining problems resolved in time for a new release in mid-January. After this poor initial showing, however, White Crane had better take the time to carefully inspect for problems.

List Price: *AutoWord*, Version 1.06, \$149.95. **Requires:** 450K RAM, DOS 2.0 or later. White Crane Systems Inc., 8560 Holcomb Bridge Rd., #103-W3, Alpharetta, GA 30202; 404-594-8180.

CIRCLE 433 ON READER SERVICE CARD

First Looks

On-Line Clip Art



Do you purchase clip art on a regular basis? Or use only two or three items in a library of 100 images? Are your clip-art shelves stocked while your wallet is empty? If you answered yes to any of these questions you may be a candidate for The Adonis Corp.'s on-line service: You buy only the clip art you need, when you need it.

Adonis's *Clip-Art Window Shopper* is a Windows 3.0-based, on-line clip-art service. *Window Shopper* lets you preview images on-screen, and then purchase items or entire libraries from a variety of popular clip-art vendors on-line.

Running *Window Shopper* and placing an order is very easy. The most difficult part is the initial new user setup. The new user is prompted through a series of menus to set up his or her communications, billing, and shipping information. This is necessary in order to log on to the Adonis Server. Using the service requires a toll call to Washington state.

Images can be previewed locally, thumbnail size, at a low resolution. Most of the thumbnail previews come packaged on the fourteen 5.25-inch disks that ship with the package; other newer additions or modifications are viewable when you log on to the server.

In addition to these image preview files, *Window Shopper* provides database files both locally and remotely. These files contain information about the clip-art publishers, categories, file formats, and other information. When you log on, you are automatically upgraded to the most recent additions or modifications to the database.

Images can be searched either by publisher's name (Micrografx, ArtRight, and T/Maker, to name a few) or by category. After deciding how to browse the database, you view thumbnail images. They can be

stored in a user-definable cache area on your system.

Most individual images can be downloaded from the service immediately; whole libraries are typically delivered by mail. Depending on the publisher, the clip is available in both bitmap and vector formats including: .PCX, .DRW, .CDR, .AI and .TBK (ToolBook) formats. The vast majority of images are stored in the .EPS format.

The cost of the images range from \$1 for simple clip art, to \$18 for extremely complex images with large file sizes.

The shipping method affects the final price. The user views the final costs before authoriz-

CaLAndar Keeps Smaller Groups on Schedule



LAN-based scheduling software lets you simultaneously manage the activities of the group, while still retaining the privacy of individual appointment calendars.

CaLAndar, from Microsystems Software, can help manage schedules for up to 50 people. The program occupies less than a megabyte of disk space on the server, and at \$695 for 11 to 50 users, it's a bargain.

The DOS-based *CaLAndar* offers on-line notification of meetings, appointments, and new e-mail messages, as well as daily, weekly, and monthly views of your calendar events. Scheduling group meetings is very easy. When someone is unavailable at a time you request, *CaLAndar* alerts you with a conflict flag and suggests alternative times.

RSVP assures you that your meeting notification message has been acknowledged, and Topview provides a summary-

level view of the people and appointments for any selected time period. Import/Export data formats include: Sharp Wizard, dBASE III, and ASCII delimited text.

Our installation on a *NetWare 386* network took only minutes. *CaLAndar* files are copied to a directory accessible by all users on your network, and the CALINST installation utility takes over.

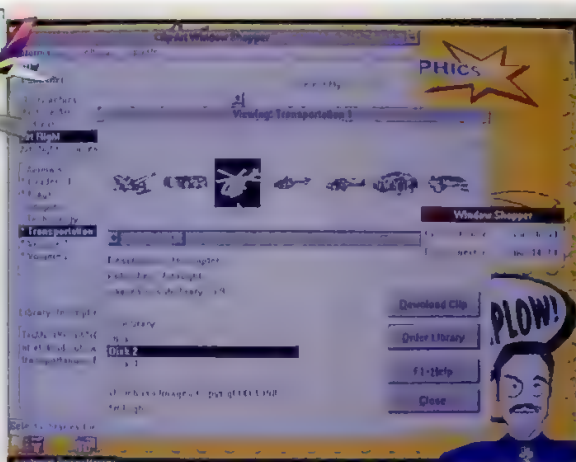
The Menu screen uses pull-down menus and includes an Appointment Book, Tasks To Do, Group Mail/Notebook, Reports, Personal Options, and Manager Facilities. The Master Calendar screen allows access of up to two years of calendar months. You can also view weekly and daily information. The lower half of the screen contains the Appointments/Tasks/Mail Windows, used for entering, editing, or displaying information.

CaLAndar operates in the foreground or as a 7K TSR. In TSR mode a Quick Reminder pop-up feature alerts you to

Shopper 1.1, \$49.95 (\$35 annual membership fee).

Requires: 640K RAM, hard disk, modem, DOS 3.0 or later, Windows 3.0. The Adonis Corp., 12310 NE 8th St., Bellevue, WA 98005; 800-234-9497, 206-451-4742.

CIRCLE 438 ON READER SERVICE CARD



After viewing lower resolution thumbnail images of the clip art within *Clip-Art Window Shopper*, users may download art like the helicopter (at left) by modem.

your assigned tasks and scheduled appointments. Built-in security includes Master and Guest access. Master offers complete access to appointments, tasks, and mail; Guest provides limited access, and no opportunity to change or delete appointments created with the originator's password.

Enable Software's *Higgins*—which got an Editors' Choice award for workgroup productivity products in our September 26, 1989, issue—has better external gateways and an MHS (Message Handling Service) interface, but uses more memory than *CaLAndar*. *Higgins* better handles the needs of a large network, while *CaLAndar* is aimed at the 2- to 50-person workgroup.

List Price: *CaLAndar 1.25*, single-user package, \$149; two to ten users, \$395; 11 to 50 users, \$695. **Requires:** hard disk, DOS 3.1 or later.

Microsystems Software Inc., 600 Worcester Rd., Framingham, MA 01701; 508-626-8511.

CIRCLE 447 ON READER SERVICE CARD

Quick, name the world's best memory manager:

NETROOM!

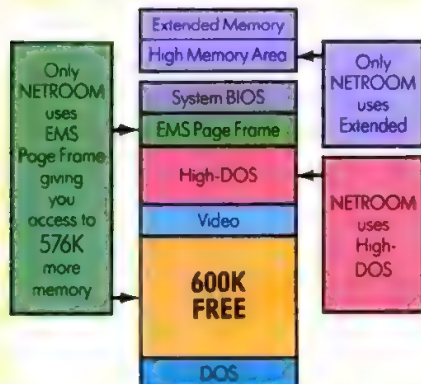


Right!

If you thought the answer is QEMM® or 386MAX®, think again. Because **NETROOM**® just beat them both, by winning PC Magazine's prestigious Editors' Choice award.

PC Magazine said* "With its versatility, this \$149 four-user version rates as a real winner. Considering NETROOM's price and capabilities, you will find that there is no second choice."

What makes **NETROOM** a winner is that it is more than a great LAN manager. It is a full-featured memory manager that not only relocates LANs (like Novell, VINES®, etc.), it also moves device drivers, and TSRs into extended, expanded, and high-DOS memory.



Features:	NET-ROOM	QEMM	386 MAX
Windows 3.0 support	✓	✓	✓
Multuser license	✓		
Converts Ext. to Exp.	✓	✓	✓
Relocates to High-DOS	✓	✓	✓
Relocates to LIM 3.2 Frame	✓		
Relocates to Expanded	✓		
Relocates to Extended	✓		
Works on 386/486	✓	✓	✓
Works on 8088/286	✓		
Memory Analysis Utility	✓		

And, **NETROOM** is the only memory manager that runs on all PCs (8088 through 80486).

But, there's more...PC Magazine says it's "The most flexible product we tested,"...and... "NETROOM uses a unique swapping feature to access data and programs in extended or expanded memory...Even PCs with tightly jammed high-DOS areas can benefit from the memory swapping capabilities of NETROOM."

And to top it all off, with **NETROOM** you will get absolutely FREE — **DISCOVER**®, an excellent utility that makes installation a pleasure and provides a detailed, real-time view of the memory configuration and

CIRCLE 313 ON READER SERVICE CARD



possibilities within a PC.

PC Magazine says "Netroom's \$149 price for four users is a steal." So, go out and steal yourself a copy!

Available from Helix or at your local dealer.

Requirements: A 386, or some EMS 3.2 or EMS 4.0 memory hardware, or at least 64K ext. memory and DOS 3.3 or greater



1-800-451-0551



*Single User, 4 User \$149, 10 User \$249 plus \$5 per order shipping & handling

HELIX SOFTWARE COMPANY

83-65 Daniels St. Briarwood, NY 11435 (718) 262-8787

Serving the
computer world
since 1984

CompUSA

COMPU DYNE 286-16



80286, 16MHz
1MB, 0 wait state
1.2 MB 5 1/4" Drive
IDE HD controller
101 keyboard
8 expansion slots

\$459

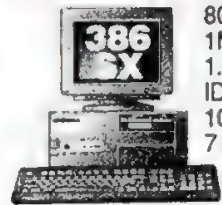
1-year limited
warranty

12" Amber 14" VGA Color
720x350 .41 dp 640x480

40MB 28ms	\$819	\$1049
71MB 28ms	\$939	\$1179
89MB 19ms	\$969	\$1199
124MB 19ms	\$1059	\$1289

Video Card Included! Fully Tested!

COMPU DYNE 386SX-16



80386SX, 16MHz
1MB, 0 wait state
1.2MB 5 1/4" Drive
IDE HD controller
101 keyboard
7 expansion slots

\$629

1-year limited
warranty

12" Amber 14" VGA Color
720x350 .41 dp 640x480

40MB 28ms	\$989	\$1219
71MB 28ms	\$1119	\$1349
89MB 19ms	\$1139	\$1369
124MB 19ms	\$1229	\$1459

Video Card Included! Fully Tested!

COMPU DYNE T386-25C



80386, 25MHz
1 MB, 32K cache
1.2 MB 5 1/4" Drive
IDE HD controller
101 keyboard
8 slots, DOS 4.01

\$1099

1-year limited
warranty

12" VGA White 14" VGA Color
640x480 .41 dp 640x480

40MB 28ms	\$1539	\$1699
89MB 19ms	\$1689	\$1849
124MB 19ms	\$1779	\$1939
211MB 19ms	\$2109	\$2269

Video Card Included! Fully Tested!

Laptops

Arima ACT 286-410



12MHz 80C286
VGA display
Keybd detaches
40MB 27 ms HD
1.44 MB floppy

\$1799

Toshiba T1000SE Call
Toshiba T3100SX Call
Megahertz T224
2400bps modem \$129
PacRim 1.2MB ext. drive \$159
Laptop bags/modems Lowest Prices

TEXAS
INSTRUMENTS



TravelMate 2000

only 4.4 lbs!
12MHz 802C86
VGA Display
20MB 23 ms HD

\$2499

Monitors



Compudyne 14/800
14" VGA Color
.31 DP 800 x 600

\$295

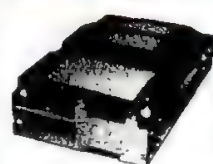
Compudyne 14/1024V
14" 1024 x 768, .28DP \$349
Compudyne 14/640V
14" 640x480, .39DP \$259
LTI 12" mono \$69
NEC Multisync 3D VGA \$629
Sony 1304 VGA 1024x768 \$649
LTI 1230A VGA mono \$105

Graphics Cards

STB VGA Basic 640 x 480 \$65
Compudyne VGA 1024
1024 x 768 \$89
ATI BasicVGA 16 \$75
ATI VGAWonder 256 Plus \$179
Sigma VGALegend \$239
Suntek MGP III Mono \$25
Leading Tech CGA Color \$25

Storage Devices

Seagate 157A Drive



40MB storage
28ms access
3 1/2" drive
IDE

\$229

Seagate ST225 20MB
w/controller \$228
Seagate ST238R 30MB
w/controller \$239
Seagate ST1102A 89MB IDE \$479
Seagate ST1144A124MB IDE \$569
Seagate ST1239A 211MB IDE \$859
Micropolis 1335 71MB ST506 \$499

Floppy Drives

Toshiba 5 1/4" 1.2MB \$62
Sony 3 1/2" 720K \$55
Sony 3 1/2" 1.44MB \$62
Pacific Rim 5 1/4" ext. \$199

Tape Backups

Compudyne 60MB Int \$229
Compudyne 120MB Int. \$319

Printers w/free cables!

Canon Bje10 BubbleJet \$325
Epson LX810 9-pin \$169
Epson LQ510 24-Pin 80 col. .. \$275
Epson LQ1010 24-Pin 132 col. \$389
Epson LQ2550 \$889
Panasonic KX-P1180 \$158
Panasonic KX-P1624
24 pin 1326 col \$399
Panasonic KX-P4420 laser \$789
TI microLaser PS17
PostScript \$1479
Seiko Label Printer \$169

Joysticks

Kraft KCIII Joystick \$14
C&H Flight Stick \$39
Quikshot Gamecard \$12
Quikshot QS123 \$10

Mice

Logitech C9 Serial Mouse \$62
Logitech Trackman Serial \$75
Logitech Trackman Bus \$79
Microsoft Serial Mouse \$84

Keyboards

Chicony 5191 Click 101 \$39
Chicony 5581 101 w/Trackball .. \$69

Boards

Complete Answering Machine \$219
Complete Communicator \$389
Creative Labs SoundBaster \$149

CompUSA, Inc.

15151A Surveyor
Addison, TX 75244

1-800-932-COMP
FAX (214) 702-0300

No Credit Card Surcharge!



Hours of operation (CST):
Monday - Friday 8am - 7pm
Saturday 9am - 4pm

* Guaranteed Satisfaction!

If you find a current lower advertised price in this publication, we will beat that price, guaranteed! Competitor must have stock. Shipping charges and surcharges will be calculated. Must be exact item.

No-Questions-asked 30-day money back guarantee on hardware. Money back guarantee does not include shipping.

To Order Call 1-800-932-COMP

We will beat any published price in this magazine...Guaranteed!

COMPUDYNE T386-33C



1-year limited warranty



80386, 33MHz
2MB, 64K cache
1.2 MB 5 1/4" Drive
IDE HD controller
101 keyboard
8 slots, DOS 4.01

\$1349

12" VGA White 640x480 .41dp 640x480 .31dp 800x600

40MB 28ms	\$1789	\$1949	\$1989
89MB 19ms	\$1939	\$2089	\$2139
124MB 19ms	\$2029	\$2189	\$2229
211MB 19ms	\$2349	\$2509	\$2559

Video Card Included! Fully Tested!

COMPUDYNE T486-25C



1-year limited warranty



80486, 25MHz
4MB, 128K cache
1.2 MB 5 1/4" Drive
IDE HD controller
101 keyboard
8 slots, DOS 4.01

\$2199

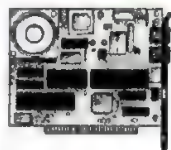
14" VGA Color .41dp 640x480 .31dp 800x600 .28dp 1024x768

40MB 28ms	\$2689	\$2729	\$2789
89MB 19ms	\$2829	\$2879	\$2939
124MB 19ms	\$2919	\$2969	\$3029
211MB 19ms	\$3249	\$3289	\$3349

Video Card Included! Fully Tested!

Modems

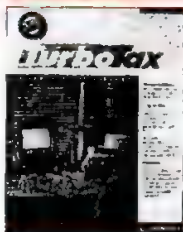
COMPUDYNE 2400i



2400 baud
Internal modem
Viscom software
\$55

ATI 2400 int. w/MNP5 \$145
Compudyne ext. 2400 \$65
Complete Fax 4800 \$139

Software



TurboTax
Simplify figuring your taxes! For all major forms.

\$39

Disk Files

5 1/4" disks holds 40 \$2.99
3 1/2" disks holds 30 \$2.99
Plastic CPU stand \$3.99

Switch Boxes

2 pos. serial \$7.99
2 pos. parallel \$9.99

Cables

6 foot parallel \$2.99
6 ft. 9-25 pin AT serial \$1.99

All returns must be in "as new" condition, w/ original packaging, w/o modifications or damage. Returns require an RMA (Return Merchandise Authorization) Number.

Defective Software exchanged for same item only. Defective hardware repaired or replaced at CompUSA's discretion.

Word Processing

Grammatik IV / Windows \$46
Microsoft Word for Windows \$279
PFS: Pro Write 2.2 w/Pro File \$149
RightWriter 4.0 \$50
WordPerfect 5.1 \$244

Spreadsheet

Lotus 1-2-3 2.2 \$319
Microsoft Excel / Windows 2.1d \$298
PFS: First Choice 3.0 w/Prodigy \$93

Graphics

Arts & Letters Editor 3.0 \$392
Corel Draw 1.2 \$299
Express Publisher 2.0 (dual media) \$82
Harvard Graphics 2.3 \$299
Microsoft Powerpoint / Windows \$279
PageMaker 3.01 \$479
PC Paintbrush IV Plus \$99
Xerox Ventura Pub. 3.0 / Windows \$499

Business/Accounting

DAC Accounting 4.1 \$76
Pacioli 2000 \$27
Peachtree Complete III \$13
Quicken 4.0 \$35

Databases

Paradox 3.5 \$489
Q & A Version 3.0 \$214

Languages

Microsoft C 6.0 \$298
Microsoft QuickBasic \$59
Turbo C++ \$125

Accessories/Utilities

386Max 5.0 \$69
Above Disc 4.0 \$55
Act! 2.0 \$209
Automenu 4.7 \$33
Avery LabelPro \$42
Calendar Creator Plus 3.0 \$35
Compuserve Starter Kit \$19
Copy II PC Deluxe Board \$102
DesqView 2.3 \$67
Direct Access 5.0 (dual media) \$58

Most orders placed before 2pm Central Time will be shipped same day.

COD, Visa, Mastercard, Discover, Checks and Cashier Checks accepted. Texas residents add sales tax. Add 3% freight charges - min. \$5/order. Orders shipped UPS Ground - call for overnight freight charges.

Software

FastBack Plus 2.1 \$109
Formwork w/ Fill & File \$78
Headroom V2.02 \$68
Mace Utilities 1990 \$78
Menu Works \$14
Microsoft Windows 3.0 \$85
Norton Commander 3.0 \$89
Norton Utilities 5.0 \$109
Optune \$42
Org Plus Advanced 5.0 \$64
PC Tools 6.0 \$79
QEMM 386 5.1 \$52
Resume Maker \$24
Spinrite II \$59
System Sleuth \$69
Virucide \$28
WinSleuth \$69

Communications

Laplink III \$84
PC Anywhere IV \$89
Prodigy 3.1 \$23

Education/Games

Algebra Plus \$27
BattleChess (dual media) \$27
F-19 Stealth Fighter \$37
Flight Simulator 4.0 \$37
Grand Slam Bridge \$18
Hoyles' Book of Games \$19
Hunt for Red October \$18
Indianapolis 500 \$29
Leisure Suit Larry \$22
LHX Attack Chopper \$35
Math Blaster Plus \$27
Math Rabbit \$20
Micro Cookbook \$24
Monopoly \$21
PC Globe + \$35
Reader Rabbit \$24
Solitaire Royale \$19
Sorcerian \$32
Teenage Mutant Ninja Turtles \$22
Test Drive III \$32
Video Vegas \$18

Not responsible for typographical errors, errors in photography, or errors of omission.

Prices and availability subject to change. Due to changing market conditions, call us toll free for current pricing and availability.

Company Purchase Orders
accepted upon credit approval.

Corporate Purchase Orders Welcome!

Computer Classics

Your Source For Software

ACCOUNTING

DAC Easy Accounting	89.00
Packit 2000	35.00
Proctree Complete III	155.00
Quickan 4.0	40.00
Timeslips III	199.00
Turbo Tax 1040 Personal	42.00
Turbo Tax 1040 Professional	229.00
Widitbuilder	145.00

CAD

Autodesk 3.0	149.00
Design Cad 3D 3.1	205.00
Design Cad 2D 4.2	155.00
Genetic Cadd 5.0	239.00

COMMUNICATIONS

Carlson Copy Plus 5.2.2	109.00
Close Up Customer 3.0	129.00
Miner III 2.0	69.00
PC Anywhere IV	99.00
Procomm Plus 1.1B	65.00
Reflection 4 Plus 4.0	299.00
Smartcom 240 3.1	195.00
Smartcom 320 1.1	112.00

DATABASE

Clarion Personal Devol 2.0	52.00
Clarion Professional Devol 2.1	475.00
Clarion Report Writer	119.00
Clipper 5.0	529.00
Date Base 4.2	459.00
DBase IV 1.1	489.00
Fieldbase Plus S/U 2.1	195.00
Foxpro S/U 1.02	459.00
Paradox 3.5	529.00
PC File 5.0	90.00
R-Base 3.1	499.00
R & R Relational Rep Writer 4.0	155.00
UI Programmer	229.00

DESKTOP PUBLISHING

Bristream Fonts (each)	85.00
Freedom of Press 2.2	249.00
GoScript Plus 3.0	189.00
PFS First Publisher 3.0	95.00
Professional Clip Art	159.00
Readright	319.00
The New Print Shop	39.00
Ultrascript Plus	309.00
Ventura Publisher Gold	549.00

EDUCATION/ENTERTAINMENT

Flight Simulator 4.0	39.00
Leisure Suit Larry III	39.00
PC Globe 4.0	39.00
Simsity	35.00
Sublogic ATP	39.00
Where...Is Carmen San Diego	32.00

FORMS/FLOWCHARTING

Flowcharting III	145.00
Formit Gold	59.00
Formtype Complete	169.00
Interactive Easyflow 6.1	105.00
Og Plus Advanced 5.0	65.00
Perform 2.1	85.00

GRAPHICS

Don Bricks Demo II	149.00
Dowperfect 1.1	279.00
Freelance Plus 3.01	329.00
Graphics Link Plus	102.00
Harvard Graphics 2.3	299.00
Hlink 2.0	109.00
Hot Shot Graphics	149.00
Inst Plus (w/Hlink)	139.00
PC Paintbrush IV	65.00
PC Paintbrush IV Plus	112.00
Pictazz Plus 2.0	65.00
Presentation Task Force	175.00
Publisher's Paintbrush	145.00

HARDWARE & PERIPHERALS

Adobe Postscript Cartridge	305.00
ATI VGA Wonder+ 256 W/Win	209.00
Best Data Trimmer 169.00	
Best Data 9624Fax/Modem Bd	185.00
Complete Hand Scanner	162.00
Copy II PC Option Board Deluxe	115.00
Everex 2400 Internal Modem	119.00
Hardcard 80L 50MB	409.00
Intel 80387SX	319.00
Intel Satisfaction Board	409.00
Logitech Bus Mouse	85.00
Logitech Serial Mouse	75.00
Logitech Scan Man Plus	185.00
Logitech Trackman Serial/Bus	89.00
MS Mouse w/Win 3.0 Ser/Bus	159.00
MS Mouse w/Print Serial/Bus	105.00
Pacific Data 1-2-4 Plus w/OMB	115.00
Pacific Data 1-2-4 Plus w/ZMB	245.00
Pacific Page 2/ZMB Memory Bd	365.00
Pacific Page Personal Edition	365.00
Pacific Print	219.00
Pacific 4 Memory Board w/OMB	75.00
Pacific 4 Memory Board w/ZMB	199.00
Pacific 4 Memory Board w/AMB	335.00
256One Font Cartridge	269.00
Plethora In A Cartridge	249.00
Plethora In A Cartridge P.E.	239.00
Proc. Parikh 2400 Ext V.42 Bts	179.00
Proc. Parikh 2400 Int V.42 Bts	179.00
Solo 286i Accelerator	299.00
Solo 386i Accelerator	469.00
Super Cartridge 1 by IQ Engine	275.00
Super Cartridge 2 by IQ Engine	479.00
Video Seven 1024i 256K	225.00
Workpoint 2400	245.00
Workpoint 2400 w/MMP	299.00
Workpoint 2496	469.00
Workpoint 9600	635.00

INFORMATION MANAGEMENT

askSam 4.2	175.00
Instant 1.1	55.00
Instant Recall	69.00
Lotus Agenda 2.0	299.00
Quick Schedule Plus	62.00

INTEGRATED

Lotus Works	95.00
MS Works 2.0	95.00
PFS First Choice w/Prodigy	105.00
Q & A 3.0 (Networkable)	229.00
Symphony 2.2	509.00

LANGUAGE/PROGRAMMING

Brief 3.0	185.00
Brief Flow Multitask	109.00
Btrieve 5.1	185.00
C Tools Plus	92.00
MS Macro Assembler	99.00
Multitask Layout 2.0	135.00
MS Basic 7.1 Devol System	329.00
MS C 6.0	329.00
MS Fortran 5.0	299.00
MS Quick Basic 4.5	67.00
MS Quick C 2.5	67.00
MS Quick C w/Assembler 2.51	135.00
Horizon Editor	49.00
Object Professional 1.1	125.00
Powerbasic	79.00
Power Tools Plus	92.00
Page Prof. Editor w/Menu	285.00
Smalltalk V 286	129.00
Turbo C ++ Professional	199.00
Turbo C ++ Prof Upgrade	149.00
Turbo C Tools	92.00
Turbo Pascal 4.0	99.00
Turbo Pascal Professional 6.0	199.00

NETWORKING

LANtastic 2MBPS Adapter	185.00
LANtastic 2MBPS Starter Kit	389.00
LANtastic Ethernet Adapter	259.00
LANtastic Ethernet Starter Kit	549.00
Novell NE1000	169.00
Novell NE2000	199.00
Western Digital Ethernet Plus	165.00
Western Digital Ethernet + 16	189.00
Word Perfect Office 5-Pack	329.00
Xarcam Packet Ethernet Adapter	399.00

OPERATING ENVIRONMENTS

Desqview 2.3	82.00
Desqview 386 2.3	135.00
DR DOS 5.0	139.00
Geoworks Ensemble	125.00
MS DOS 3.3	72.00
MS DOS 4.01	72.00
VM 386	135.00

OS/2

IBM OS/2 Standard Edition 1.2	295.00
Lotus 1-2-3 G	529.00
Multicscape OS/2 Debugger 1.1	309.00
OS/2 Presentation Manager	345.00
Smalltalk V PM	299.00

PROJECT MANAGEMENT

Harvard Project Manager 3.01	455.00
Schier Project Scheduler V	429.00
Timeline 4.0	469.00

STATISTICS/SCIENCE

Brainmaker	149.00
Chi Writer Deluxe	249.00
Deriva	125.00
Grapher	145.00
Mathcad 2.5	319.00
Mathematica 386 w/387 Supp	845.00
Print A Plot 2.0	189.00
SPSS/PC Plus 3.1	549.00
Statgraphics	569.00
System 5.0	669.00

SPREADSHEET

Always (Lotus 1-2-3 w/Symphony)	115.00
Baler XE	579.00
Impress	79.00
Lotus 1-2-3 Var. 2.2	339.00
Lotus 1-2-3 Var. 3.1	419.00
Lucid 3D	65.00
Quattro Pro 2.0	319.00
Quattro Pro Upgrade	99.00
Sideways 3.2	42.00
Baler 5.0	359.00

UTILITIES

1 Dir + 3.0	49.00
386 To The Max Pro 5.1	72.00
Above Disk 4.0	65.00
Amidisk	59.00
Automenu 4.7	39.00
Brooklyn Bridge 3.0	89.00
Central Point Backup	65.00
Carus	99.00
Check It	85.00
Copy II PC 6.0	27.00
Copywrite	65.00
Direct Access 5.0	69.00
Disk Technician Advanced	95.00
Feedback Plus 2.1	115.00
Headroom 2.0	75.00
Intelligent Backup	99.00
Lap Link Release III	92.00
Lotus Magellan 2.0	109.00
Mace Utilities 1990	92.00
Webroom (10 User)	159.00

WINDOWS

Marion Animations	92.00
Marion Commander 3.0	99.00
Marion Utilities Advanced 5.0	115.00
PC Tools Powerpak	75.00
PC Tools Deluxe 6.0	87.00
Power Menu	59.00
Print Cache	99.00
Print Q	79.00
Q-Dos II	39.00
Queen 386 5.1	62.00
Quam	52.00
Software Bridge 4.1	79.00
Software Casual	55.00
Spiralite II	67.00
Turbo EMS 5.0	55.00
V Cache	49.00
Virex PC	75.00
XView Pro Gold	79.00

WINDOWS

Adobe Illustrator for Windows	305.00
Adobe Type Manager	59.00
AMI Professional	309.00
Asymetric Toolbook	309.00
Bristream Facilit	69.00
Card Draw 2.0	389.00
Crossstalk for Windows	125.00
Dynacomem Asynch for Windows	189.00
Facit for Windows	169.00
Fake Views	369.00
Graphicsk IV for Windows	52.00
IndC Windows Express 3.0	52.00
IndC First Apps	52.00
IBM Current 1.1	239.00
Jeflorm Design 2.2	265.00
Language Master for Windows	49.00
Micrographs Designer 3.01	485.00
Micrographs Charisma	345.00
MS Excel 2.1	319.00
MS Powerpoint for Windows	329.00
MS Project for Windows	469.00
MS Windows 3.0	99.00
MS Windows Entertainment Pak	30.00
MS Windows Productivity Pak	45.00
MS Windows Device Driver	345.00
MS Windows Software Dev. Kit	335.00
MS Word 1.1 for Windows	329.00
OmniPage 386 2.1	599.00
Pactnet	255.00
Pagemaker 3.01	499.00
Perform Pro	279.00
Soft Type	115.00
Spiralite Plus	289.00
Superbase 4 for Windows	435.00
WIN Connect	82.00
Wings	319.00
Wordcam Plus 2MB	699.00
Xenix Formbase 1.1	319.00

WORD PROCESSING

IBM Displaywrite V 2.1	245.00
Grammatik IV	52.00
MS Word 5.5	229.00
Professional Write w/Pro File	165.00
Rightwriter 4.0	59.00
WordPerfect 5.1	249.00
WordPerfect 5.1 Station	159.00
WordStar 6.0	249.00

XENIX/UNIX

SCO Fieldbase + 386	729.00
SCO Unix Development Sys 386	749.00
SCO Unix Operating Sys 386	675.00
SCO VP/TK (Unlimited)	675.00
SCO VP/TK (2 User)	365.00
SCO Xenix Operating Sys 386	575.00
Wordperfect for SCO	
Xenix 5 User	509.00



WORDPERFECT™ 5.1 Includes the Tables feature which automatically encloses data you create. The Equation Editor includes an extensive collection of symbols, characters, and mathematical functions. You can define mailing label formats, hyphenation is now dictionary-based, mouse support is offered, and spreadsheets can be imported into WordPerfect 5.1 documents.

Special Value \$249.00



FORMTYPE Complete combines the power of a relational database with the flexibility of forms software to create customized multi user office automation systems that conform to the workflow they are automating. With *Formtype*, documents can link to other forms or dBase files directly, print custom or pre-printed forms with full font control, generate reports, and recalculate instantly. Completed applications can be distributed as single user (Data Entry Version) or *NETBIDS* and *Novell* Compatible (LAN Version) applications.

Special Value \$169.00

WINTER SPECIALS

- BUY FREELANCE RECEIPT CALCULATOR/PEN SET FREE!
 - FROM CENTRAL POINT: BUY CP BACKUP AND GET YOUR "BACKUP LICENSE FRAME HOLDER" FREE! also FREE with PC TOOLS PURCHASE RECEIVE A PC TOOLS KEY RING
 - FROM ASHTON TATE: BUY DBASE 4 V 1.1 AND GET CONTROL ROOM FREE!
 - PER: FORM 2.1 New Lower Price- \$85
 - FREE HARVARD GRAPHICS MOUSE PAD WITH ANY SPC SOFTWARE PURCHASE.
 - BUY VIREX AND GET A FULL COLOR MOUSE PAD.
- All promotions good while supplies last
- FREE! \$140 MONT BLANC PEN WITH PURCHASE OF WORDSTAR 6.0 ONLY \$249 (offer valid through January 31, 1991)

PLEASE CALL US FOR PRODUCTS NOT LISTED. WE WELCOME CORPORATE AND INTERNATIONAL ORDERS. WE SHIP TO APO & FPO ADDRESSES

TO ORDER, OR INQUIRE CALL
818-347-7500, 800-733-3888
(US/CANADA) ♦ OR FAX YOUR ORDER
818-347-9977

Card, and American Express. • 2% surcharge on American Express. • 15% restocking fee for all non-defective items returned. • Please call (818) 347-9400 for an authorization number on defective goods or your return will not be accepted. • Due to copyright laws we cannot take any software where the seal has been broken. • (Domestic Sales) \$5.00 minimum shipping per item, less on bulk orders. • \$10 Blue Label shipping • \$4.50 C.O.D. charge. • International sales call for freight pricing. • Heavier items are charged accordingly. • We do not guarantee compatibility. • Call for prices for any software item not included in this ad. • Order desk open 7 A.M. to 5 P.M. Monday to Friday (PST), Saturday 10 A.M. to 2 P.M. P.O. Box 10598, Canoga Park, CA 91308 Showroom: 7959 Deering Ave., Canoga Park, California 91304.

CIRCLE 205 ON READER SERVICE CARD

by
Cristina Córdova
and Nate Zelnick

New & Improved

News of Announced Products and Upgrades

MSound Stereo Add-on Stimulates Your Senses

NEW Your PC can now generate CD-quality stereo effects, with full right-to-left panning, for \$249.95. **MSound International** has introduced **MSound Stereo**, the first peripheral based upon a true digital signal processor (DSP)—the TMS320 series from Texas Instruments. **MSound's** use of DSP technology increases the number, programmability, and quality of sounds that can be generated, and enables simultaneous sound and graphics. **MSound Stereo** offers both 16-bit sampled and synthesized sounds. Since it is partly a software-based product, updates provide the highest-quality sound available.

The **MSound Stereo** hardware unit attaches to the PC's parallel printer port. A printer can then be plugged into it and operated transparently. The price includes hardware, headphones, and sampled sound and utility disks.

List Price: **MSound Stereo**, \$249.95.

MSound International LP, 550 Kirkland Way, #100, Kirkland, WA 98033; 206-828-8182.

CIRCLE 435 ON READER SERVICE CARD

AST Research Unveils Upgradable Notebook PC

NEW **AST Research** has introduced two notebook PCs that bring a new dimension—upgradability—to the portable computer market. The **AST Premium Exec 386SX/20** and **286/12** each measure 2.25 by 11.4 by 9.0 inches (HWD), and weigh 6.5 pounds with a battery. Prices start as low as \$2,495.

The **Premium Exec 386SX/20** includes 2MB RAM (expandable to 8MB), VGA, a 3.5-inch, 1.44MB floppy disk drive, one serial port, one parallel port, and support for an 80387SX coprocessor. The **Model 23V**, with a 2.5-inch, 20MB hard disk, is priced at \$2,995, while the **Model 43V** with a 2.5-inch, 40MB hard disk costs \$3,395.

The 12-MHz **Premium Exec 286/12** is upgradable to 20-MHz **386SX** microprocessing speed and contains 1MB RAM (expandable to 8MB), VGA, a 3.5-inch, 1.44MB floppy disk drive, one serial port, one parallel port, and support for an 80287 coprocessor. The **Model**



AST's 6.5-pound **Premium Exec 386SX/20** features a "paper-white" VGA screen.

23V includes a 2.5-inch, 20MB hard disk and retails at \$2,495. The **Model 43V**, with a 2.5 inch, 40MB hard disk, lists at \$2,895. The processor upgrade option is priced at \$499.

Both notebooks come with a custom-designed carrying case and AC adapter. They also feature extensive power management for maximum battery life, 82-key standard keyboard layout with 101-key functionality, and a tilt stand.

The systems are bundled with several software packages including DOS 3.3 and **Traveling Software's LapLink III** and **Battery Watch**.

List Price: **Premium Exec 386SX/20 Model 23V**, \$2,995; **Premium Exec 386SX/20 Model 43V**, \$3,395; **Premium Exec 286/12 Model 23V**, \$2,495; **Premium Exec 286/12 Model 43V**, \$2,895; upgrade to **386SX/20**, \$499. **AST Research Inc.**, 16215 Alton Pkwy., P.O. Box 19658, Irvine, CA 92713-9658; 800-727-1278, 714-727-4141.

CIRCLE 436 ON READER SERVICE CARD

HOT PROSPECT

EXCEL 3.0 BY MICROSOFT: NEW FEATURES HEADED BY OUTLINING, OLE SUPPORT

Microsoft's long-awaited **Excel 3.0** is packed with new features, but takes full advantage of the **Windows 3.0** environment to remain one of the simplest spreadsheets to use. The long list of new features includes a goal-seeking command comparable to *1-2-3/G's* **Backsolver**, an expanded **Undo** command, stylesheets, font options (from a tool bar comparable to the ribbon/ruler in **WinWord**), and 3-D charting. Drawing tools let you create and alter text boxes, rectangles, ovals, lines, and buttons.

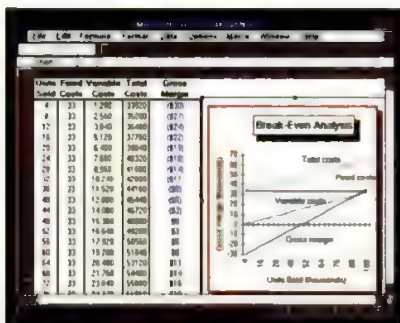
Excel supports data consolidation (with formulas linked to subsidiary worksheets) and links transparently to *1-2-3* worksheets (including **.WK3**). Any object can be "Paste linked" into **Excel** from an OLE- (object linked embedded) supported application.

A worksheet-outlining feature of up to seven rows by seven columns allows you to collapse or expand your worksheet outline to display any desired level of detail.

List Price: **Microsoft Excel 3.0**, \$495.

Requires: **Windows 3.0**, 1MB RAM, 3MB free hard disk space, 5.25- or 3.5-inch high-density drive. EGA, VGA, 8514, or Hercules graphics board and monitor.

Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 206-882-8080.



With a plethora of new features, **Excel** may be Microsoft's best app in 1991.

CIRCLE 434 ON READER SERVICE CARD

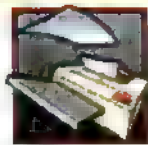
Protect Your PC with The Norton AntiVirus

NEW To combat all those deadly viruses floating around in the PC world, **Symantec Corp.** has developed **The Norton AntiVirus**. The company says **TNA** is the only PC software package capable of detecting, eradicating, and protecting your system against known MS-DOS viruses.

TNA can be operated via pull-down menus or the command line, and supports mice. It scans for viruses—or irregularities that could signal an unknown virus at work—on any local or network drive and repairs them. A memory-resident program, **Virus Intercept**,

CONTINUES ON PAGE 56

BRIEFS



PRINTERS

Output Technology has introduced the LaserMatrix 1000, Model 3 (\$5,995), an HP-compatible, continuous-form desktop laser printer with a claimed speed of 16 pages per minute. It is intended for a wide range of business applications, including those that need high resolution and high-speed label and bar codes. Stored forms are supported in custom as well as AIAG and HIBCC formats. Output Technology Corp., 509-926-3855.

Star Micronics has entered the personal laser printer market with a 4-ppm laser printer that uses Intel's RISC architecture. Priced at \$1,395, the Star LaserPrinter 4 is fully compatible with the HP LaserJet IIP and has 14 internal fonts. It features a 16-character LCD and dual paper feeds. Star Micronics, 800-447-4700.



VGA BOARDS

Headland Technology announced the Video Seven VRAM II, a VRAM-based VGA card designed to optimize performance in graphical environments on 386 and 486 PCs. With either 512K (\$599) or 1MB (\$799) display memory, VRAM II supports 1,024-by-768 resolution on both interlaced and noninterlaced monitors. It is guaranteed to run all VGA software and is backward-compatible with earlier graphics standards. Headland Technology Inc., 415-623-7857.

Definicon International's CAD RACE VGA adapter provides 20 extended graphics modes with resolutions up to 1,024 by 768. Priced at \$495, the CAD RACE offers a selection of 256 colors from a palette of 262,144 and displays up to 792,000 colors simultaneously. Definicon International Corp., 800-253-RACE or 714-961-0438.



CONNECTIVITY

Lantronix's second product line is a series of miniature Ethernet transceivers (\$149.95). The LTX-T connects terminal equipment to twisted-pair Ethernet LANs, while the LTX-2 links the equipment to a thin-coax LAN. Both provide collision detection and have a switch-selectable SQE function. Lantronix, 714-367-0050.

CONTINUED FROM PAGE 55

examines every file brought onto or taken off the PC. The software also provides password protection to secure your configuration.

Users can instantly update their software to protect against new viruses by using the Symantec 24-hour MS-DOS Virus Newline (408-252-3993). The Symantec on-line bulletin board (408-973-9598) enables users to download or install virus definitions with a simple menu command.

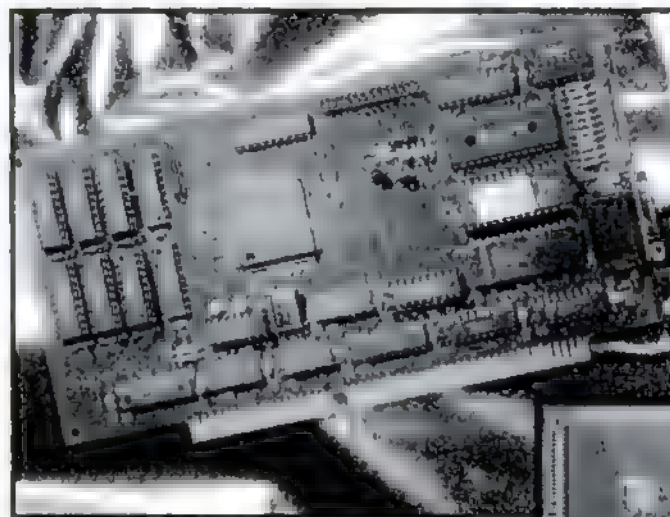
List Price: *The Norton AntiVirus*, \$129.95.

Requires: 384K RAM, 24K RAM resident memory, MS-DOS 2.1 or later. Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014-2132; 800-343-4714 ext. 700, 408-253-9600.

CIRCLE 437 ON READER SERVICE CARD

Boca Super VGA Board: More for Your Money

NEW. The new, aggressively priced (as low as \$175), SuperVGA board manufactured by Boca Research uses the Tseng Laboratories



For a great price, Boca offers a Super VGA board that uses the new Tseng Labs chip.

single graphics chip. The state-of-the-art ET4000 chip delivers high-memory clock speeds that provide fast performance in critical areas such as screen updates and video image refresh rates.

The SuperVGA by Boca is designed to enhance the performance of both interlaced and noninterlaced VGA or multiple frequency monitors. The adapter automatically switches to the required video mode, depending on the software in use.

The board's 512K configuration supports a 1,024-by-768-pixel resolution and displays a maximum of 16 colors from a palette of 262,144. The 1MB configuration displays 256 simultaneous colors with a resolution of 1,024-by-768 pixels.

List Price: SuperVGA by Boca board, 256K, \$175; 512K, \$195; 1MB, \$245. Boca Research Inc., 6401 Congress Ave., Boca Raton, FL 33487-2841; 407-997-0918.

CIRCLE 438 ON READER SERVICE CARD

Bridge Batch Taps into the Power of Windows

NEW. *Bridge Batch* from Softbridge eliminates the drudgery of performing repetitive tasks, moving between applications, sharing data, and many other time-consuming processes. The software allows you to transform your *Windows* standalone applications into a user-specific, customized workstation under *Windows*. Data can be automatically passed between *Windows* applications via *Bridge Batch's* support of dynamic data exchange (DDE).

With *Bridge Batch's* menu builder you can create pull-down menus to launch *Windows* applications and files. You can also design dialog boxes, bitmaps, and icons. A recording facility allows capture, playback, and editing of keystrokes and mouse movements.

In addition, *Bridge Batch* provides an editor with a graphical, menu-driven interface for the creation and modification of batch files.

List Price: *Bridge Batch*, \$179. **Requires:** *Windows* 3.0. Softbridge Inc., 125 Cambridge Park Dr., Cambridge, MA 02140; 800-955-9190, 617-576-2257.

CIRCLE 439 ON READER SERVICE CARD

RGB Corp. Simplifies Multimedia Production

NEW. A PC-based multimedia editing and post-production system from RGB Corp., *Media-Link/PM*, operates on a standard Micro Channel PC under OS/2 Presentation Manager. Integrating graphics, animation, and character generation, *Media-Link/PM* uses the video display adapter to generate charts, copy, logos, drawings, and animation from standard software. It puts up to 13 source VTRs and four record decks on-line in the edit mode, and its Editing Decision List handles up to 10,000 edit actions.

Media-Link/PM provides information on the input, output, and status of all devices on one screen; there are two video picture inputs and one video output on the PC display. It also monitors VTR status, motion control, edit, track-insert, and transition control.

The system supports a variety of video formats, including BetaCam SP, VHS, Super VHS, HiBand 8-mm., laser disk, and optical disk. It also supports MIDI, lights, digital disk video systems, and audio tape recorders. Providing zero-frame accuracy using SMPTE Time Code, it supports EBU and control track.

List Price: *Media-Link/PM*, \$4,100 to \$7,599. **Requires:** 80386 processor, Micro Channel architecture, and OS/2 Presentation Manager. RGB Corp., 3944 Florida Blvd., #4, Palm Beach Gardens, FL 33410; 407-622-0138.

CIRCLE 440 ON READER SERVICE CARD

EVIDENCE

REPORT CARD **INFO WORLD**

SPREADSHEET SOFTWARE

Quattro Pro
VERSION 2.0

Criterion	(Weighting)	Score
Performance		
Formulas analysis	(100)	Very Good
Compatibility	(50)	Excellent
Speed	(75)	Very Good
Database	(75)	Excellent
Graphics	(50)	Good
Output	(50)	Excellent
Documentation		
Ease of learning	(100)	Very Good
Ease of use	(50)	Very Good
Error handling		
Support	(25)	Satisfactory
Support policies	(25)	Satisfactory
Technical support	(100)	Excellent
Value		8.7
Final score		

WORLD

SPREADSHEET SOFTWARE

Lotus 1-2-3
VERSION 3.1

Criterion	(Weighting)	Score
Performance		
Formulas analysis	(100)	Good
Compatibility	(50)	Excellent
Speed	(75)	Good
Database	(75)	Very Good
Graphics	(75)	Very Good
Output	(50)	Very Good
Macros	(50)	Good
Documentation		
Ease of learning	(50)	Poor
Ease of use	(100)	Satisfactory
Error handling	(50)	Very Good
Support		
Support policies	(25)	Very Good
Technical support	(25)	Satisfactory
Technical support	(100)	Satisfactory
Score		6.7

Borland's Quattro Pro is the best spreadsheet.

Quattro® Pro 2.0

"Quattro® Pro provides more features and better performance than 1-2-3..."

BYTE, November 1990

"Quattro Pro offers some of the most powerful charting and best-quality output you'll see in a spreadsheet today."

PC Magazine, December 1990

"Overall, Quattro Pro has the best set of database features we've seen in a spreadsheet."

InfoWorld, December 1990

"Quattro Pro 2.0 also offers more interactive presentations, a more flexible desktop environment and smaller RAM requirements."

PC Week, October 1990

Lotus® 1-2-3® r 3.1

"... only masochists need to try [1-2-3, Rel. 3.1]. Performance was so sluggish on a 1Mb Compaq 386™/20 that we gave up after half an hour."

InfoWorld, October 1990

"... it [Lotus 1-2-3 Release 3.1] doesn't have everything you expect from a graphical interface..."

PC World, September 1990

"...(1-2-3's) WYSIWYG module has little knowledge of what is going on in the primary program..."

PC Week, October 1990

"While the division of labor is mostly logical, it makes [Lotus 1-2-3's] system feel like exactly what it is: a patchwork."

PC Magazine, December 1990

Lotus users! Save \$395 off Quattro Pro 2.0! If you own Lotus 1-2-3, you can upgrade to Quattro Pro 2.0 for only \$99⁹⁵! This includes our 60-day, money-back guarantee. Order today! See your dealer or CALL NOW 1-800-331-0877

CIRCLE 287 ON READER SERVICE CARD

B O R L A N D

Makers of Paradox®, Quattro® Pro, Turbo C++, Turbo Pascal® and Sidekick®

Upgrade pricing good in U.S. and Canada only. 386 is a trademark of Intel Corporation. Copyright © 1991 Borland. 81 1387

CODE: MB26

QUATTRO PRO 



BRIEFS



CONTINUED FROM PAGE 56

Gateway Communications is shipping the G/EtherTwist transceiver. The \$150 G/EtherTwist enables existing coaxial Ethernet adapters, fan-outs, repeaters, or other devices to operate over unshielded twisted-pair (UTP) wiring. It complies with the 10Base-T standard for Ethernet LANs, detects data collision, and has SQE and Link Test switches. Gateway Communications Inc., 714-553-1555.

NCR's new 92C03 low-power Ethernet transceiver draws an idle current of less than 35mA. A nonoperating mode reduces it to 250nA. The NCR 92C03 is a twisted-pair design that meets the 10Base-T standard and features integrated analog interfaces. It is an ASIC-based application-specific standard product. NCR Corp., 714-837-4694.

Zenith's new ChannelMizer, priced at \$1,995, interconnects Ethernet nodes over a 15-mile radius within a high-speed broadband network. Although the ChannelMizer uses only one 6-MHz channel, it is equipped with an RF modem capable of operation over five 6-MHz channels. Zenith Electronics Corp., 708-391-8181.

Niwot Networks has introduced the AT/SD wide area network card for the 16-bit ISA bus. It combines high-speed communications options with the advantages of bus mastering. The AT/SD supports a single communications interface (V.35 or EIA-530) with speeds from 56 kilobits per second to 4 megabits per second. Niwot Networks Inc., 303-444-7765.

CNet Technology is offering a complete line of 10Base-T products. Based on the IEEE 802.3 standard, all network interface cards support Novell. Software drivers allow the cards to operate in network environments such as 3+Open, LAN Manager, NetBIOS, NetWare, and PC/TCP. Boards are equipped with ETHERnostics for self diagnosis of potential data collisions. The portable adapter supports UTP cabling, as does the 12-port concentrator. The transceiver converts AUI cabling to UTP. CNet Technology Inc., 408-954-8000.

Always Technology Ships 32-bit Caching SCSI-II Host Adapter

NEW. Designed for use with EISA bus PCs, Always Technology's new 32-bit caching SCSI-II host adapter features large cache size and high performance. The AL-4000 delivers a data transfer rate of up to 33MB per second and operates in caching and noncaching modes. An Intel 82355 Bus Master Interface Controller (BMIC) interfaces with the EISA bus, while an 80286 microprocessor (which uses a separate bus with 128K SRAM and two EEPROMs) serves as a data manager and cache controller.

Always Technology's Burst Transfer Technology allows data to be buffered or held in the operating system-independent cache and then transferred across the 32-bit bus at microcomputer speeds.

In order to accommodate the necessary memory, Always Technology has equipped the AL-4000 with eight SIMM sockets, which allow for up to 32MB of user-installed page-mode cache memory. Either 256K, 1MB, or 4MB memory chips may be installed.

The standard configuration includes 2MB of cache memory, a Novell NetWare 386 (3.1) Network Loadable Module, an on-board floppy disk drive controller, and an external connector for tape drives, CD-ROMs, optical disks, and other SCSI devices. Configuration of the AL-4000 is automatic, via included setup software.

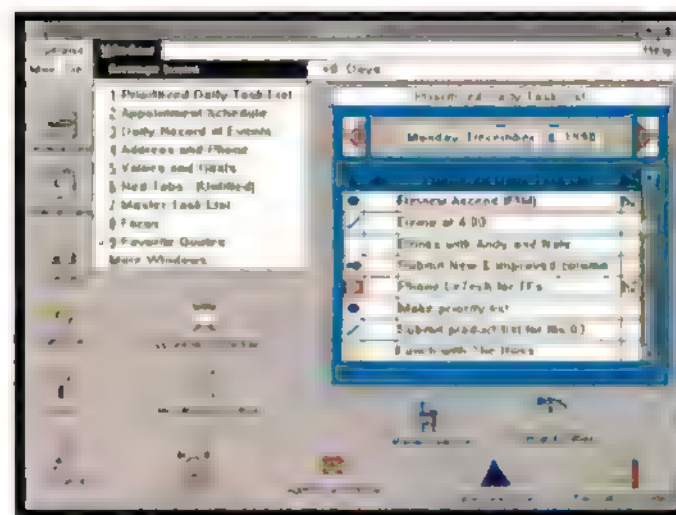
List Price: AL-4000, \$895. Always Technology Corp., 31336 Via Colinas, Westlake Village, CA 91362; 818-597-1400.

CIRCLE 441 ON READER SERVICE CARD

Ascend Allows You to Scale New Heights of Personal Productivity

NEW. A new personal information manager (PIM) from LeTECH International helps you to achieve your goals more efficiently, effectively, and easily. Based on the Franklin International Institute's Time Management System, *Ascend*, a Windows-based PIM, takes full advantage of such amenities as graphics icons, pull-down menus, and dialog boxes.

Its modules include address and phone books, an appointment scheduler, a weekly view calendar, and a daily record of events. A master task list integrates tasks into your daily planning and allows you to put them into one of five user-defined categories, while a Values and Goals feature, a prioritized daily task list, and a Focus feature help you concentrate on the highest priority task. Allowing you to create your own organization tools, *Ascend* offers red tabs that keep miscellaneous lists



Ascend's prioritized daily task list helps you keep your day in perspective.

and information. Also available is Turbo file. Other unique PIM modules include a database of favorite quotes, a journal, special days, tools and utilities, and reports.

List Price: *Ascend*, \$199. *Ascend* and *Windows 3.0* package, \$299.95. **Requires:** 2MB available hard disk space, 640K, DOS 3.1 or later, *Windows 3.0*. LeTECH International Inc., 2607 S. Decker Lake Blvd., Salt Lake City, UT 84119; 801-957-1776.

CIRCLE 442 ON READER SERVICE CARD

OBM Cuts Cost of Full-Page Color Scanners

NEW. For only \$995, you can purchase a full-page color scanner from **Our Business Machines**. The ProScan PS-3000 is capable of 300- by 300-dot-per-inch resolution and 24 color bits per pixel; it recognizes 16.8 million colors. It can also scan 256 levels of gray scale for work with black-and-white images. Fully compatible with the HP ScanJet Plus, the ProScan PS-3000 has a sheet-feed design, feeding paper up to 8.5 by 14 inches. The provided interface card is ISA or MCA compatible.

In addition, an upcoming 256 gray level model, the PS-1500 Professional Grayscale Scanner, is an upgrade of the earlier PS-1000, which handled 64 gray levels.

OBM will bundle the PS-1500 with Astral Development's *Picture Publisher* and the PS-3000 with *Picture Publisher Plus*, an image editing software package that allows manipulation of scanned images. With the help of OCR software such as Calera's *WordScan* you can easily convert documents into text files. For an additional \$300 you can purchase a special ProScan/WordScan bundle.

List Price: ProScan PS-3000, \$995; PS-1500, \$1,095; *WordScan* OCR bundle, an additional \$300. **Requires:** 6MB hard disk space, VGA to display gray scale, DOS 3.1 or later, *Windows 3.0* for bundled software. Our Business Machines Inc., 12901 Ramona Blvd., Irwindale, CA 91706; 800-433-1435, 818-337-9614.

CIRCLE 443 ON READER SERVICE CARD

Don't miss the Second Annual International Paradox User's Conference. April 7-10, 1991. Call 1-800-942-8872.

Make Powerful Connections with Borland's New Paradox

By any standard, Paradox® is the most powerful database. That's why it's been rated #1 by every leading computer publication, and why hundreds of thousands of users worldwide have switched to Paradox.

Now there's another reason to switch to Paradox—it *connects*.

Now Ready to Connect with SQL

With Paradox® SQL Link (sold separately),* Paradox makes it easy to connect PCs to the networks and SQL servers of your choice.** No programming is required. Users don't need to learn SQL. And since LAN traffic is kept to a minimum, answers to queries are delivered FAST!

All the power and ease-of-use of Paradox now transparently connect with your SQL data, including: Query By Example, multi-table forms and reports, presentation-quality graphics and much more.

Connects with Programmers

Paradox includes a full development language (PAL™) for building complete database applications. And now, with Paradox SQL Link, programmers can integrate SQL statements into PAL programs, use SQL table cursors, trap server error codes, and tap the unique capabilities of different database servers.

Connects with the Full Power of Your PC

Paradox 3.5 incorporates VROOMM™ and Turbo Drive™. These proprietary Borland technologies let Paradox

automatically optimize your computer's use of available memory, and access up to 16Mb of RAM on 286/386™/486™ PCs. The result is lightning-fast database performance on any PC.

dBASE Owners! Step Up for Only \$175⁰⁰

At \$795, Paradox is the best database value around. And to introduce its power and speed to dBASE® users, we're making an outrageous offer: If you own any version of dBASE, we'll sell you Paradox 3.5 for only \$175⁰⁰ (Does not include Paradox SQL Link, sold separately).† Paradox will read and write dBASE files for easy integration into your existing environment.

Upgrade to Paradox 3.5 Now.
See your dealer or call
1-800-331-0877

BORLAND

Makers of Paradox®, Quattro® Pro, Turbo C++, Turbo Pascal® and Sidekick®

CODE ME30

*Paradox SQL Link (\$495 suggested retail) is an add-on product for Paradox 3.5 and is required to make the connection with SQL servers. **Microsoft, IBM, Oracle and DEC RDB/MS servers supported now. †Offer also good for owners of any version of dBASE or dBase. Proof of ownership is page 10 of the manual is required. Satisfaction guaranteed or your money back. Upgrade offer expires March 31, 1991. Upgrade pricing good in U.S. and Canada only. Mail orders to: Borland International, Inc. P.O. Box 660001, Scotts Valley, CA 95067-0001. Add \$9.00 for shipping and handling. Residents in CA, CT, GA, IL, IN, MA, MI, MN, NY, OH, PA, TX, VA and WA please add appropriate sales tax. For orders outside the U.S., call (408) 438-5300. 386 and 486 are trademarks of Intel Corporation. Copyright ©1990 Borland. All rights reserved. BI 1395

Improved

BRIEFS



WORD PROCESSING

WordPerfect's interim release of *LetterPerfect* supports keystroke macros. The software also allows path definitions for printers, and for the program's Speller and Thesaurus components. Upgrades for 5.25-inch disks: \$11; \$14 for 3.5-inch. 801-225-5000.

Starlite Software now offers *Galaxy Lite* (\$79)—a smaller version of its *Galaxy* word processor—for systems with memory constraints. 206-385-9611.



SCANNERS

Olduvai Corp.'s Version 2.0 of *Windows OCR* software packages, *Read-It! OCR* (\$495; upgrade for \$49) and *Read-It! Personal* (\$295; upgrade for \$29), are now available. Both add increased speed, improved memory management under *Windows*, and new file-format support, as well as new font libraries and scanner drivers. In addition, *Read-It! Personal* now has a text merge feature. 305-665-4665.

Caere Corp.'s new *OmniPage Professional* (\$995) adds a host of user-configurable options to its scanning software, including a verification window, deferred processing, multiple file recognition, redefinable column selection, custom character recognition, and multiple zone configuration. The package also includes the previously separate *OmniSpell* and *OmniDraft* modules. 408-395-7000.

Xerox Imaging Systems announced a *Windows* 3.0-based graphical user interface for its high-end text recognition system, the K5200 scanner (\$19,950). 617-864-4700.



CAD

IMSI's *TurboCAD*, Release 2, now runs up to five times faster and uses disk caching to optimize memory usage. Upgrades to the \$149 package are \$49. 800-833-4674.

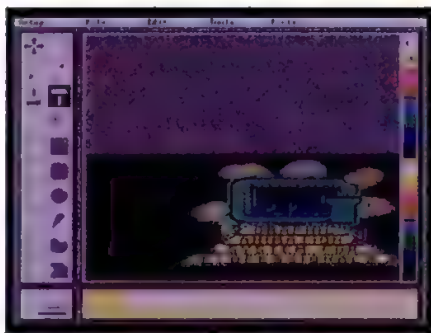
Cyco International's *AutoManager*, a fast drawing file viewer for *AutoCAD*, now supports *AutoCAD*, Release 11. Cyco has also released *AutoBase*, a graphical database for organizing *AutoCAD* drawing files. 404-634-3302.

GRasp, 4.0 Adds Digitized Sound

IMPROVED

GRasp, Version 4.0—Paul Mace Software's Graphic Animation System for Professionals (*GRasp*) now offers digitized sound through Creative Lab's Sound Blaster board, and comes bundled with Terravision's *The Graphics Link Plus (TGL+)* for capturing, converting, and printing images. In addition, *GRasp* 4.0 (\$395) supports Autodesk *Animator* files, and has a compiler to create stand-alone runtime sequences. The new version also includes enhanced mouse support and improved disk access capabilities, and can drive video at resolutions up to 1,280 by 1,024 with 256 simultaneous colors. Paul Mace Software Inc. of Ashland, Ore., can be reached at 800-523-0258 or 503-488-2322.

CIRCLE 702 ON READER SERVICE CARD



GRasp's powerful animation language includes a simple point program.

Lotus Fleshes Out Toolkit for 1-2-3

IMPROVED

Lotus Add-In Toolkit for 1-2-3, Release 3.1—Lotus has released an enhanced version of *Toolkit for 1-2-3*, a software package that allows customization of spreadsheets using @ functions and macros, and creation of add-in products and turn-key applications. Release 3.1 adds support for C and event notification and allows debugging under DOS. Upgrades are available for \$90; the kit retails for \$395. Lotus Development Corp. is located in Boston, Mass., 800-343-5414 or 617-577-8500.

CIRCLE 703 ON READER SERVICE CARD

XTreeGold 2.0 Offers Pull-Down Menus, DOS Shell, and New Tools

IMPROVED

XTreeGold, Version 2.0—Optional pull-down menus and a DOS shell have been added to XTree Co.'s hard disk file-management program. The *XTree* applica-

tions menu recognizes over 700 programs and builds a launch menu (in *XTree's* outline format) of executable files. New file-management tools include undelete; new file viewers; a zip manager to create, view, and unzip archives; directory comparison; one-command copy/delete; and a user-configurable partial drive log. The program retails for \$149; registered users can upgrade for \$40. Users of competitive products may upgrade to *XTreeGold* for \$50. Contact XTree Co. of San Luis Obispo, Calif., at 800-282-5003 or 800-634-5545.

CIRCLE 704 ON READER SERVICE CARD

Invisible Network Includes TransBios

IMPROVED

Invisible Network, Version 2.0—*Invisible Network*, a low-cost peer-to-peer network, now includes *TransBIOS*, a communications protocol that increases speed and efficiency by analyzing traffic between clients and servers and transparently altering the number of network packets as needed. A new expanded memory manager creates shadow RAM out of VRAM or uses existing shadow RAM to increase accessible DOS memory. Version 2.0 also includes disk caching and an automatic reconnection utility. Model 200 (1.8 megabits per second) is available for \$215, Model 300 (3.0 Mbps) for \$315, Micro Channel (3.0 Mbps) for \$399, and Ethernet (10.0 Mbps) for \$369. Registered users can upgrade for \$150. For more information, contact Invisible Software of Foster City, Calif., at 415-570-5967.

CIRCLE 705 ON READER SERVICE CARD

Hilgraeve Releases \$99.95 DOS-only Edition Of HyperACCESS/5

IMPROVED

HyperACCESS/5, Version 2.0—Hilgraeve now offers a \$99.95 DOS-only edition of its full-function asynchronous communications package, which was formerly available only in a combined DOS-OS/2 package. A \$199.95 DOS-OS/2 upgrade is also available. Both of the new packages support additional automated scripting commands including if-then, else, and while statements. The upgrade packages also offer fast file-transfer protocols, on-the-fly file compression, V.42 modem support, a text editor and protection against 91 known viruses. Version 2.0 also takes advantage of the 16550 serial communications chip—found in all PS/2s, on the Hayes ESP card, and as a plug-in replacement for the 8250 and 16450 chips—for increased speed and reliability of data transfer. Contact Hilgraeve in Monroe, Mich., at 800-826-2760.

CIRCLE 706 ON READER SERVICE CARD



Uncle Sam Says

**BE
SAFE!**

"Buy your next PC from one of my most responsible suppliers. Over the past ten years **more than 700 of my agencies and their contractors** bought Iverson Computers."

HIGH PC RATINGS

PC SOURCES, December 1990

"One company that offers the right mix of technical and sales advice, a wealth of options, and after-sale support is Iverson..."

Washington Business Journal

"Iverson delivers quality for the money. Iverson uses... premium parts in its machines."

HIGH COMPANY RATINGS

Forbes Magazine, 1989

"Iverson... ranked #26 among the Best Small Companies in America."

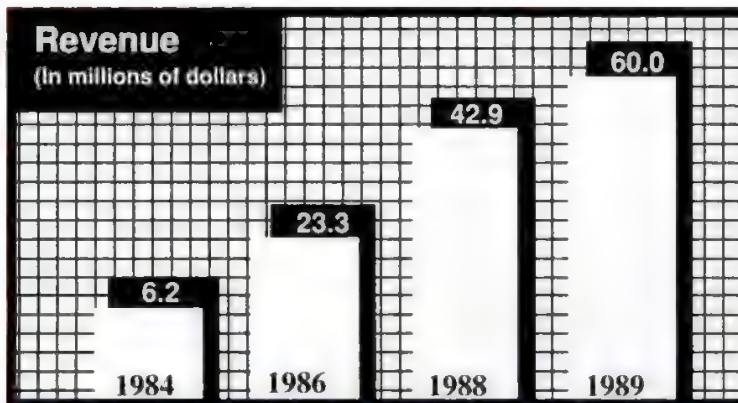
Business Week, 1988

Rated Iverson as its 11th Top Growth Company of 1988

BUY FROM STRENGTH AND EXPERIENCE

Net Worth Analysis PC Companies as of 12/31/89

RANK	COMPANY NAME	NET WORTH AMOUNT \$	SOURCE	SHIPPED 1ST COMPUTER
1	Iverson Computer	\$20.914M	SEC	1979
2	Gateway 2000	\$6.697M	D&B	1985
3	Zeos International	\$2.200M	SEC	1987
4	Northgate	\$.900M	D&B	1987



OVER



BUY IVERSON - IT'S THE SAFEST

Parent Company
Founded 1978;
Traded on the
AMEX (IVT)

WITH MOST EXPERIENCED SUPPORT

BEST 386/SX BUYS

386SX/16 MHz

- 1 MB High Speed RAM Expandable to 8 MB
- 1.2 MB 5.25" or 1.44 MB 3.5" Floppy Drive
- Reads & Writes Hi & Low Density Disks
- 80 MB 19ms IDE Hard Disk Maxtor
- 14" VGA Color Display 1024 x 768 .28 Dot Pitch
- 16 Bit VGA Card w/ 512K
- 1024 x 768 Driver Software
- Dual IDE/Floppy Disk Controller
- 2 High Speed Serial & 1 Bidirectional Parallel ports
- Enhanced 101 Fujitsu Keyboard

\$1719



**SAME AS ABOVE WITH
386SX/20 MHz
System board**

\$1877

\$479

IVERSON 286

\$730

IVERSON 386SX 16MHz

Experienced Customer Focused Infrastructure



Iverson operates two huge classified systems integration contracts nationwide, over 15 million dollars a year in revenue for each year.

Iverson Computers are manufactured in the firm's own 48,000 square-foot plant in Clearwater, Florida.

Iverson operates its own full service FCC laboratory at the Florida plant.

Iverson designed computers rely on the very best, name brand components available: Maxtor, Seagate, Fujitsu and Sony disk drives; Tatung, Acer, Western Digital, Fujitsu and STB displays, controllers, floppy drives and keyboards. Custom system boards with genuine Intel CPUs and math coprocessors. Oversized switchable Senstron power supplies.



Total Quality Control means

incoming, in line, test and burn in, cosmetic, packaging, and shipping inspection. Furthermore, individual custom foam packing of each system insures safest shipping.

**BE SAFE - ORDER NOW
1-800-444-PC90**

GSA LOW PRICES FOR FEDERAL EMPLOYEES

Federal/Military/Active/Retired employees, with proper ID, are invited to purchase computers at Iverson's GSA prices...the government's own special prices. GSA price offer limited to GSA schedule products that are below mail order prices. (Contract prices established by subsidiary, International Technology Corporation with GSA Contract Number: GSOOK90AGS5276. Some configurations not available on GSA contract.) Call toll-free to receive GSA schedule or to place an order: **1-800-388-GSA1**

FEATURES

- 1 MB on SX, 512K ON 286
- Your choice of
- 1.2 5.25" or 1.44 3.5" Floppy
- Dual IDE/Floppy Disk Controller w/ 2 High Speed Serial & 1 Parallel Ports
- Oversized Filtered Power Supply
- Enhanced 101 Keyboard
- Baby AT Case
- FCC A & FCC B Approved
- Optional: Mini Tower case



FOREIGN DEALERS WANTED

Safe Established Support

Experienced technical support or on-site service is only a phone call away. Iverson world-wide supports include 24-hour toll-free technical and service support hotlines. Our 5000 square foot repair depot next to Dulles Airport supports ten Iverson operated field service offices (9 in the US, 1 in Germany) and 130 TRW service offices in the U.S. and 100 in Canada with over 4,500 different parts.



Full Integration Services Available

- Design and Install LANS
- Custom Hardware
- World-wide installation & Training
- Software loaded at plant
- Custom application software and printer drivers

"Numerous calls to the sales and technical lines were answered promptly and accurately."

... PC SOURCES reviewer



BEST POWER BUY

386/25 MHz

- 1 MB of High Speed 32Bit RAM Expandable by SIMM to 8MB
- 1.2 MB 5.25" or 1.44 MB 3.5" Floppy Drive
- Reads & Writes Hi & Low Density Disks
- 179 MB 20ms IDE Fujitsu Hard Disk
- 14" VGA Color Display 1024 x 768 28 Dot Pitch
- 16 Bit VGA Adapter w/512Kb
- Dual IDE/Floppy Disk Controller
- 2 Serial & 1 Bidirectional Parallel Port
- Enhanced 101 Fujitsu keyboard

\$2297

LOW COST PRINTERS

4 PPM	Okidata Laser	\$749
8PPM	Postscript Laser	2250
9 Pin	NX-1001	149
24 Pin	NX-2420	299
Free 6 Foot Parallel Cable Included		
Other Models Available		

HARD DRIVE OPTIONS

IDE	ESDI w/ controllers
40 MB ..\$ 271	150 MB\$1,283
80 MB491	330 MB1,854
100 MB ...636	650 MB2,711
179 MB ...786	SCSI
200 MB 1,041	1 GB\$5,580
.....	Erasable cartridge

DISPLAY OPTIONS

(price includes monitor & adapter)

12" Mono TTL, 720 x 350	\$131
14" Mono VGA, 640 x 480	263
14" Color VGA, 640 x 480	431
14" Color VGA, 1024 x 768	550
16" Color VGA, 1024 x 768	962

FLEXIBLE CONFIGURATIONS

BE SUPPORTED - ORDER NOW

1-800-444-PC90

IVERSON

COMPUTER CORPORATION

Attn: DI

1356 Beverly Road • McLean, VA 22101

TEL: (703) 749-1200 FAX: (703) 883-0722 TELEX: 289 127ITC UR

\$1479

IVERSON 386/33MHz with 64K cache

\$2395

IVERSON 486/25MHz

WE CUSTOM DESIGN AND INSTALL LANS ANYWHERE



ORDER NOW -BY MAIL OR PHONE
800-444-PC90

Name _____
Address _____
City _____ State _____ Zip _____
Phone (____) _____
☐ Check ☐ VISA ☐ M/C ☐ COD Certified Ck
Card # _____ Expiration Date ____/____/____
Signature _____

ITEM	DESCRIPTION	PRICE	QTY	TOTAL
CPU				
HD				
DISPLAY				
PRINTER				
Shipping Add 3% of cost to Total				TOTAL \$

FEATURES

- 1 MB 32 Bit SIMM Memory easily upgradable on motherboard to 16MB on 386 & 64 MB on 486
- Your choice of
- 1.2 5.25" or 1.44 3.5" Floppy
- Dual IDE/Floppy Disk Controller w/ 2 High Speed Serial & 1 Parallel Ports
- Oversized Filtered Power Supply
- Enhanced 101 Keyboard
- Full Size AT Case
- Optional: Tower case



How to send messages without spinning your wheels.

Introducing
WordPerfect
Office™ 3.0.

With services
such as E-mail,
WordPerfect Office is
an easy yet powerful solution
for companies who want their
network to keep up to speed with
the way they work.

WordPerfect Office Mail (Office

Mail) puts simplicity at your finger-
tips. The Office Mail screen shows
you everything you need to com-
pose and circulate messages to an
individual, a group, or the entire
corporation. Since Office Mail is so
easy to use, you'll spend less time
managing messages and more time
doing what you do best.

Office Mail brings you and
your company face to face with the
power to send messages
and up to 100 attached
files of any format. You
can send carbon and
blind copies and keep
your messages confi-
dential by using pass-
word protection and
encryption. With unique
tracking capabilities,
Office Mail even gives

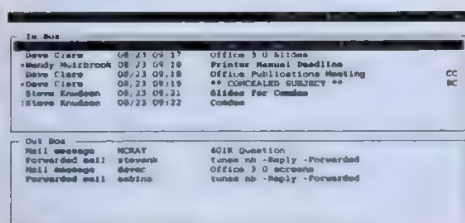
you control over messages that
have already been sent. It can notify
you immediately when a message
has been delivered, opened or
deleted. If your mail message hasn't
been read, it can be retracted and
deleted; or edited and then resent.

WordPerfect Office includes
scheduler, calendar and powerful
desktop utilities. These combined
with our gateway services make it
easier than ever to send messages
around the world. For more infor-
mation about WordPerfect Office
3.0 call us at 1 (800) 526-5162.

WordPerfect CORPORATION

1555 North Technology Way Orem, Utah, 84057
Tel: (801) 225-5000 Fax: (801) 222-5077

WordPerfect is a registered trademark of
WordPerfect Corporation in the United States.
WordPerfect Office is a trademark of WordPerfect
Corporation. ©1990 WordPerfect Corporation.



Tab Out Row: F1 Undo: Shift-F1 Setup: F2 Help: F7 Exit
1 Read: 2 Delete: 3 Save: 4 Info: 5 Group: 6 Mail Map: 7 Phone Map: 8

WordPerfect Office Mail

edited by
Matthew J. Ross

Read Only

Reviews of the Latest Books for the PC User

In Search of Better Presentations

In a world where the flood of information can overwhelm, two experts reexamine the subject of presenting information clearly, in graphics and desktop publishing.

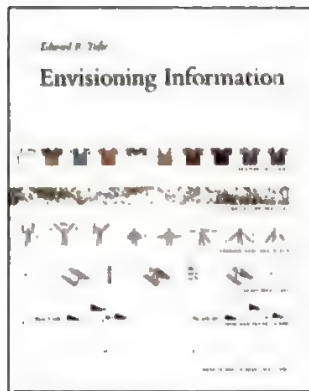
■ *Envisioning Information*

by Edward R. Tufte
Graphics Press, \$48

Seven years ago, Edward R. Tufte, a professor at Yale, penned *The Visual Display of Quantitative Information*, a seminal and controversial guide to producing information-rich graphics. Now, just as the presence of more-powerful machines has enabled graphics to expand into the third dimension and beyond, Tufte offers us *Envisioning Information*, a gorgeous, almost lyrical book that's really a sequel to the earlier work.

Envisioning Information consists of six heavily illustrated chapters that discuss ways to convey multi-dimensional data within a two-dimensional drawing or table; the author's methods include judicious use of color, pattern repetition, layering, and more importantly, imagination.

Envisioning Information covers color usage more thoroughly than Tufte's previous work, and most of the illustrations in the sequel are in color. Tufte stresses the point that color can carry information instead of just dressing up a graphic. Think of a map in which the blue of an ocean deepens according to depth. The varying hues add a second dimension—indicating not only the location of the ocean, but also the depth at



In his book, Tufte stresses data analysis over design presentation.

different points.

While Tufte lays out general rules for optimizing the data content within a given drawing, I suspect that he has a higher information overload threshold than most people. I found some of his examples too crowded and confusing, cramming too much information into too little space. And though I agree with Tufte's desire to see more informative graphics, I can't help but think of all the PC-based tools I've seen whose rigid pick-and-choose graphs leave little room for creativity.

The two books differ less in content than they do in style, form, and tone. *Visual Display* offers theory based on observation; *Envisioning Information* offers example and anecdote. If you haven't read either one, *Envisioning Information* provides the less-rigorous read. After consuming either of these must-read books, your view of data-based graphics changes forever.

—Lori Grunin

Graphics Press, Cheshire, CT
06410; 203-272-9187.
ISBN: 0-9613921-1-8

CIRCLE 306 ON READER SERVICE CARD

■ *Looking Good in Print*, second edition by Roger C. Parker Ventana Press, \$23.95

The one thing that *hasn't* changed since Roger C. Parker first wrote *Looking Good in Print* is that PC-based publishers too often focus on desktop publishing technology rather than aesthetics. The second edition of this classic book, which is appropriately subtitled "A Guide to Basic Design for Desktop Publishing," is still trying to correct this persistent problem.

The general observations that comprise the first third of the book are the most useful, but the chapters that deal with the 25 most-common design errors and DTP makeovers are the most fun. There is a genuine pleasure to be had from watching the miraculous transformation from a design frog to DTP prince, and some good subliminal learning takes place, too.

Parker assumes that readers are familiar with the necessary hardware and software, leaving him free to concentrate on a variety of design concepts, such as the various flavors of display type and the appropriate use of supporting visual material.

Subsequent chapters in *Looking Good in Print* cover an amazingly broad range of applications under the desktop publishing rubric, such as newsletters, tabloids and newspapers, advertising, sales brochures, catalogs, and presentation graphics. The overview format, however, forces Parker to highlight only the most basic differences between the various applications.

In addition to obvious categories, such as the preparation of transparencies

and overheads, *Looking Good in Print* also tackles more-mundane business-oriented publishing projects. He shows how boring catalog listings can be made visually interesting and easier to read. He even demonstrates the importance of good design when dealing with the intricacies of complex addresses in coupons and response rates on survey forms.

Though I can't argue with Parker's design acumen, I found his attempts to address technical issues—relating to both computers and traditional prepress methods—to be superficial and potentially confusing. For example, his discussion of support graphics programs, which he characterizes as "draw" versus "paint," can easily mislead users about the benefits of vector versus raster images. The book glosses over production issues, like paper choice and color usage, that can seriously influence the quality of the final printed product.

Looking Good in Print is deliberately broad at the expense of being deep. Those



users who already know the focus of their DTP efforts might be better served by more-detailed,

process-oriented books, such as Mr. Parker's own *Newsletters from the Desktop*. However, for the beginning publisher this book is a solid introduction to universally applicable design concepts.

—Luisa Simone

Ventana Press, Chapel Hill, NC
27515; 919-942-0220
ISBN: 0-940087-32-4

CIRCLE 307 ON READER SERVICE CARD



WE BRING THE HIGH COST OF NEW-TECH DOWN FAST.

Every time some hot new CPU comes along, up pops a host of new monitors to go with it. Expensive ones.

Then in a couple of years, prices come down. Way down. You know the cycle.

At Samtron, we specialize in speeding up this process.

Our Sedai design team takes the latest monitor technology and refines it. Designs it for easy production as well as high performance and reliability.

And since we are the world's largest CRT manufacturer, we're able to produce most of it in our own facilities. Which brings costs down even more.

That's how we can offer you color monitors to go with whatever you have that's new. Be it PC or PC/AT or IBM 8514 or MAC II. At prices that are way ahead of their time.

New Super Series has .31 or .28 dot pitch, and 800 x 600 or 1024 x 768 resolutions. Even 8514/MAC II compatibility.



SAMTRON

WE'RE WORTH WATCHING

CIRCLE 296 ON READER SERVICE CARD

14251 E. FIRESTONE BLVD., SUITE 101, LA MIRADA, CA 90638 (213) 802-8425

by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Tools for Pen-Based Computers Taking Shape

On January 22, Go Corp. unveiled its long-rumored system for converting the handwritten word into machine-readable text.

The technology, which had been described in only the broadest terms before this (see Pipeline, September 25, 1990) is embedded in a 32-bit object-oriented multitasking operating system called PenPoint that, in its initial release, runs on 386 processors.

While the technology will eventually be adapted for a standard PC, right now PenPoint is designed for use on a notebook-size computer that has no keyboard, just a pen and a display.

It's not yet a commercial product. Go has introduced a

developer's toolkit and has built several thousand demonstration portables to help get products into development. But Go's plan is to license the operating system to manufacturers who will then create commercial products.

Go's operating system performs the conversion of handwriting into text characters almost instantaneously (see illustration below). PenPoint attempts a translation of the screen image whenever the pen is lifted from the screen surface.

PenPoint reserves special properties for particular types of symbols; for example, it interprets a carat as an insertion mark.

In fact, PenPoint introduces an entire interface, which Go is

calling the Notebook User Interface (NUI). Go hopes that the interface will be the cornerstone of PenPoint's acceptance. If the NUI is well received by users, manufacturers will be eager to introduce products based on the technology.

The potential for a universal portable computer interface to transform information technology is immense.

The first uses are likely to be supplements for existing database applications.

Because Go Corp. had been showing its work to established computer companies on a quiet basis for the last two years, the public unveiling of PenPoint was matched with announcements of support from other companies, including IBM, Borland, Lotus, and WordPerfect.

One of the more ambitious plans is from Slate Corp., a

company formed for the specific purpose of creating products for pen-based computers. Slate says it hopes its software will become the "dBASE of pen-based computing."

If you can judge an idea by the people who believe in it, Slate seems to be on the right track. Dan Bricklin and Bob Frankston, the pair who created *Visicalc* in 1979, and John Friend, author of *PC-Outline* and *GrandView*, are working full time at Slate.

Slate is planning to fill the gap between PenPoint's user interface and the lack of applications with software that it calls *PADS* (*Pen Application Development System*). *PADS* is a set of tools for designing forms and managing data entered on a pen-based computer.

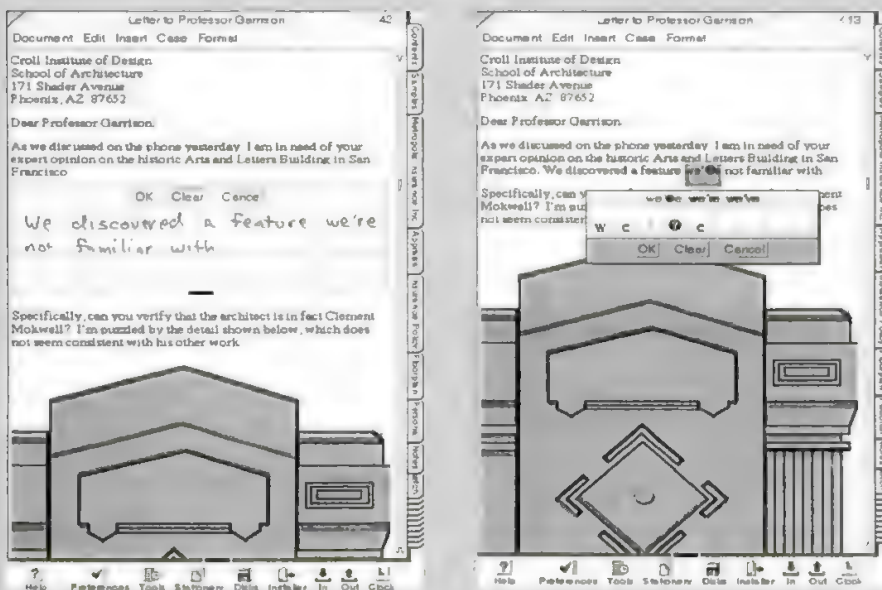
Slate believes that the market for pen-based computers is very strong among people who work in the field: sales agents, customer service representatives, and field engineers.

In most cases, the data these people need to record and retrieve will be part of a larger database on a host. In fact, the early adopters will probably want to run applications very much like today's PC database applications, except that the users will want to work almost exclusively with forms.

One advantage of completing a form on a pen-based machine over using pencil and paper is that the computer can use pull-down menus. A form field could provide a button that, when touched by the pen, would open a choice of entries.

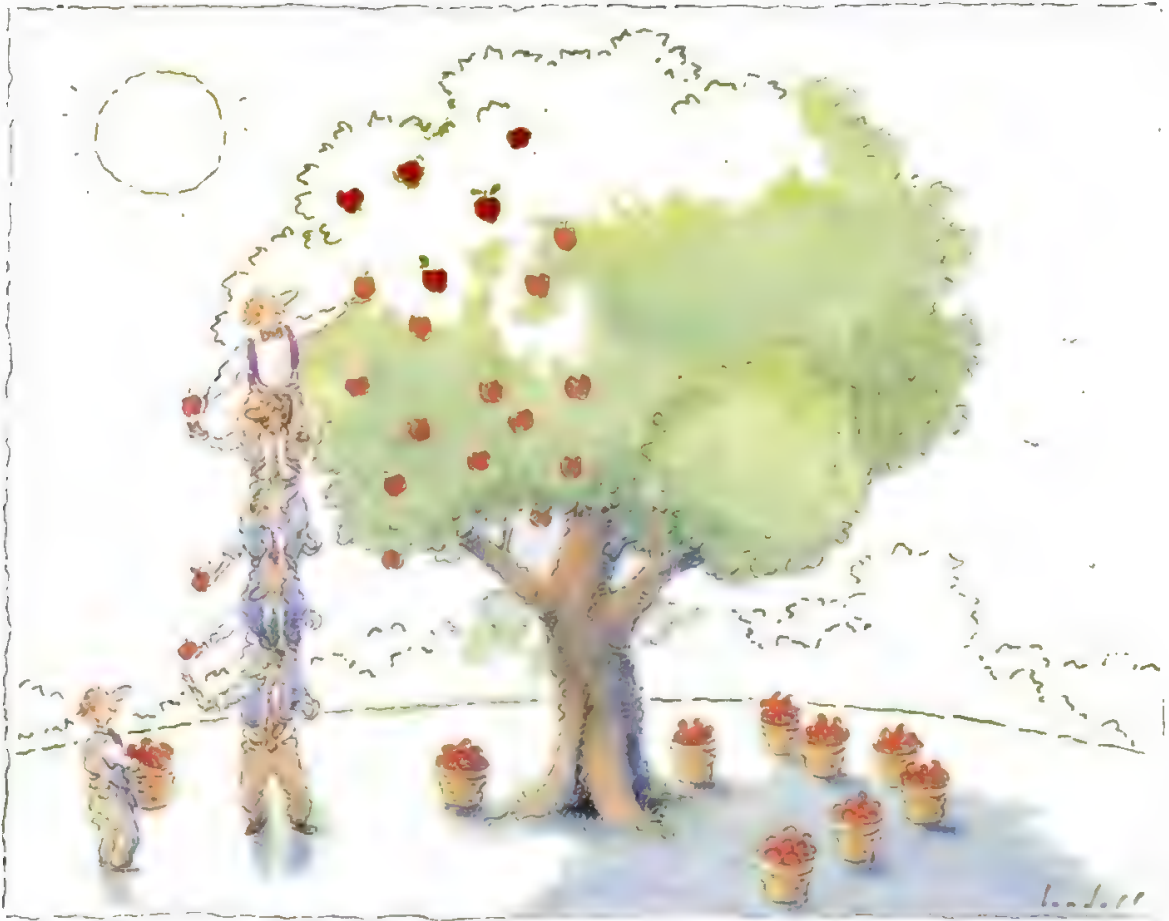
Form fields that required text can be filled simply by writing in the information.

Go's demonstration machine uses a DOS file system and a serial interface. Slate's *PADS*



In this prototype of a PenPoint word processor, the user adds text (at left) by writing the words on-screen with a pen. In the document at right, those parts of the sentence that were translated at a high-confidence rate are inserted; the word "we're" was given a low-confidence rating so the application prompts the user for a confirmation.

CONTINUES ON PAGE 69



Put Primavera multiuser to work. And see an instant improvement in team performance.

Large projects demand more than an assembled project team. *Teamwork* is what makes things happen.

That's the essential idea behind the multiuser capabilities of Primavera Project Planner®. Unlike many "multiuser" project management packages, Primavera offers *simultaneous* access to project files—and allows *simultaneous* generation of reports and graphics. The project team gets more done because team members aren't waiting in line for computer time.

Everything needed to plan and execute your project is included in the software: lightning-fast scheduling, resource management, cost control, reporting and graphics. Special features simplify coordination, communication and cooperative control by the team.

Primavera's record-locking design protects activity data. Project access levels are password-protected too.

Frequent interaction among team members is made easy with the software's own electronic mail system. You don't have to exit Primavera to leave a message for an associate or check the internal project bulletin board.

What's more, every Primavera Project Planner package lets you choose single user or multiuser functionality for your Novell, 3Com or Banyan network. You can grow into a multiuser environment without any cost penalty.

Call **1-800-423-0245** for a free video preview of the software. Or, ask for a personal demonstration—and see firsthand how Primavera can help pull a project team together.



PRIMAVERA
*How the world says
project management*

Two Bala Plaza • Bala Cynwyd, PA 19004 • (215) 667-8600 • Fax: (215) 667-7894

CIRCLE 148 ON READER SERVICE CARD

Pipeline

CONTINUED FROM PAGE 67

software is designed so that applications can be developed on a PC and then transferred into the pen-based computer.

It believes that a practical application for using a pen-based computer can be developed and debugged in a matter of hours.

A typical application would be an insurance claims adjuster's report; the adjuster could check off items that were tracked by codes using pull-down menus or write down text the same way the adjuster would use a paper form on a clipboard.

In time, word processors and spreadsheets that work under PenPoint will probably be introduced. WordPerfect has already said it has such a word processor under development.

One of the few leading PC software companies that has not announced plans to develop under PenPoint is Microsoft: It expects to create handwriting recognition extensions to *Windows* within a few years.

Hayes Begins to Enforce AT Command Set Patents

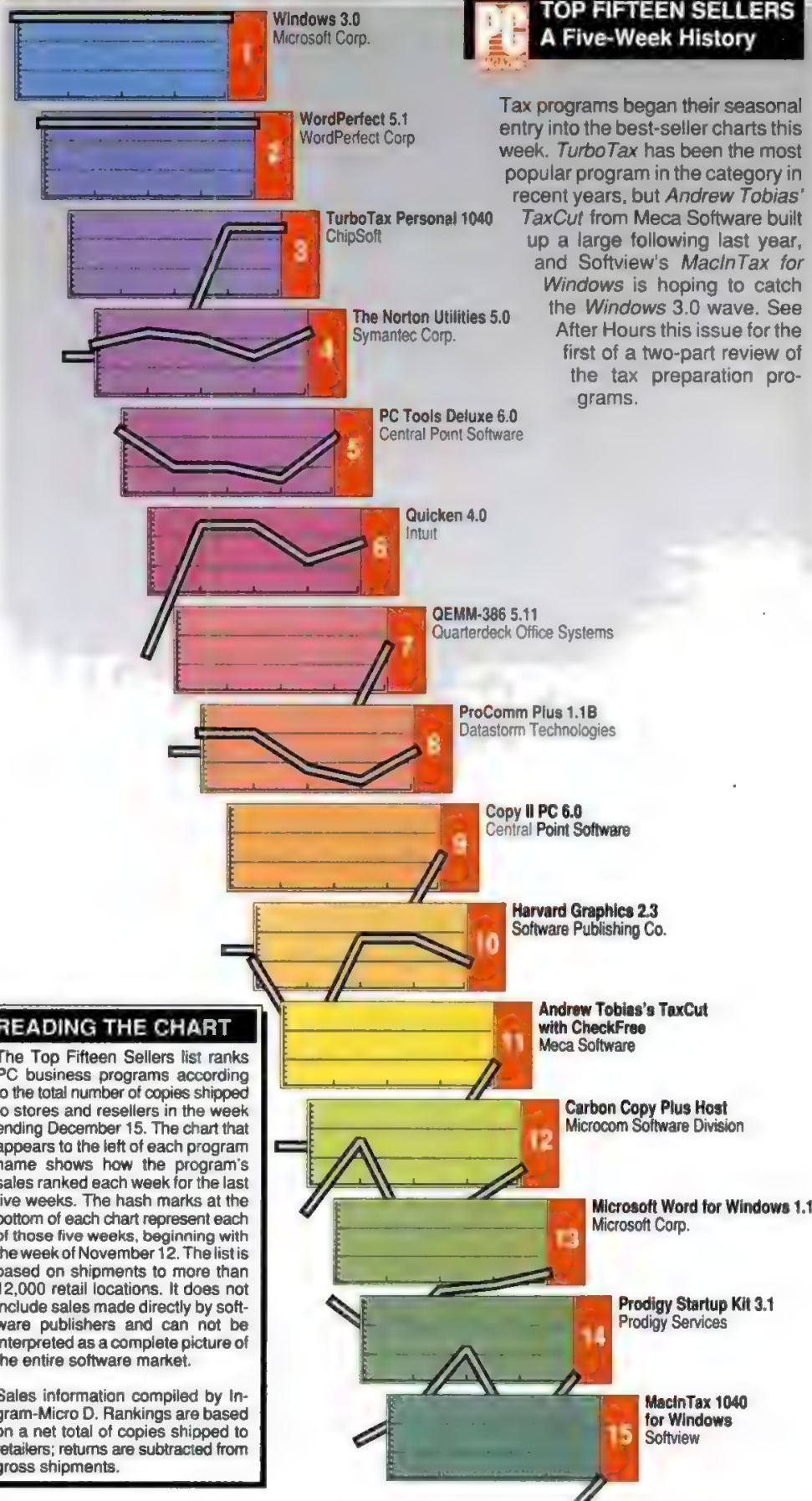
Prices for some Hayes-compatible modems may be going up soon. Hayes is suing five modem makers for patent infringement: Ven-tel, Prometheus, Omnitel, Everex, and Multitech.

The case against the first four is set for a January trial in San Francisco; the case against Multitech is in pretrial hearings in Minneapolis.

Fifteen modem manufacturers have licensed Hayes technology, but the company says it has been unable to reach an agreement with these five.

Hayes' suit asks that the companies be enjoined from manufacturing modems on the basis that they violate a Hayes patent.

The U.S. patent was granted in October 1985, and describes a way for modems to switch from command mode to on-line mode by receiving escape sequences at certain periods of time. According to Hayes, any modem that is Hayes-compatible uses the technique.



Tax programs began their seasonal entry into the best-seller charts this week. *TurboTax* has been the most popular program in the category in recent years, but *Andrew Tobias' TaxCut* from Meca Software built up a large following last year, and Softview's *MacInTax for Windows* is hoping to catch the *Windows 3.0* wave. See After Hours this issue for the first of a two-part review of the tax preparation programs.

The difference betw fax board and

Intel's new SatisFAXtion™ fax board costs less than \$500. And while that prices it well under some fax boards, there are still cheaper alternatives.

So we thought it only fair to explain what you'll be getting with ours.

Or, missing with theirs.

1. The SatisFAXtion board is the only one that lets you fax a document exactly as you'd send it to your printer.

One step, five seconds, and you're back to work. There's no easier way to fax—period.

2. With the SatisFAXtion board you get true WYPIWYF™—what you print is what you fax. Text is never distorted, fonts never switched, formats never lost. You can even connect a scanner and fax

**Ordinary fax boards
make you look this bad.**

**The SatisFAXtion board
makes you look this good.**

photo-quality images with up to 256 levels of grey.

3. Once a fax starts coming in or going out, most boards bring the work your computer's doing to a screeching halt. Even a simple fax could tie up your PC for several minutes. But the SatisFAXtion board has its own dedicated 16 MHz micro-processor. All your faxing happens entirely in the background, so you and your PC don't skip a beat.

4. The SatisFAXtion board automatically configures and installs itself in your PC. Cheaper boards are a nuisance, with DIP switches, jumpers, and long, convoluted procedures to mess with.

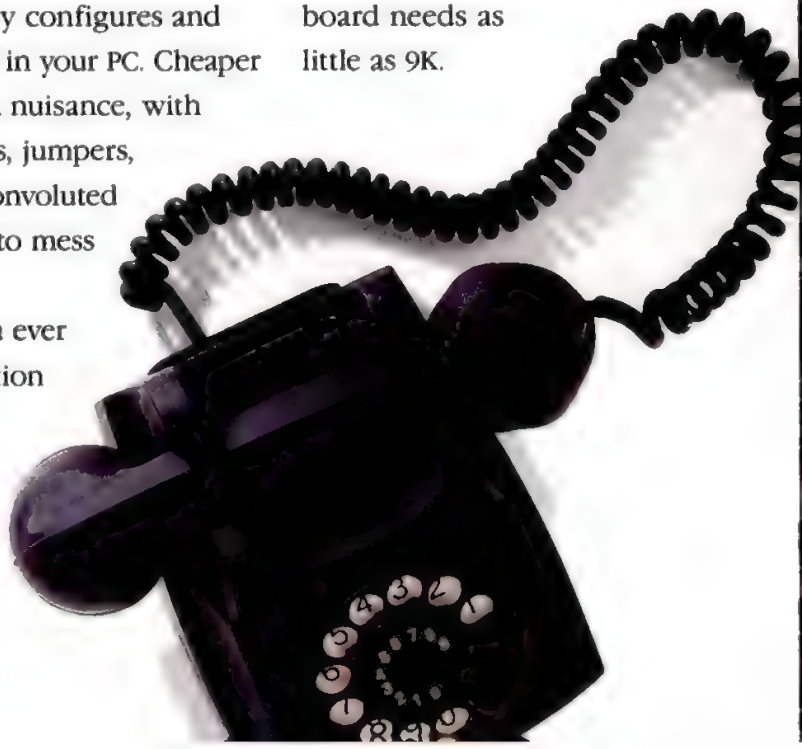
5. If you ever have a question about your

SatisFAXtion board, you can get answers directly from Intel experts—either by phone, fax, or modem.

6. Offices don't communicate by fax alone, so the SatisFAXtion

board gives you a built-in MNP 5 modem that works twice as fast as ordinary modems. This alone is worth \$300!

7. While cheaper boards hog over 100K of conventional memory just to send a fax—even if your PC has expanded RAM—the SatisFAXtion board needs as little as 9K.



een an inexpensive a cheap one:

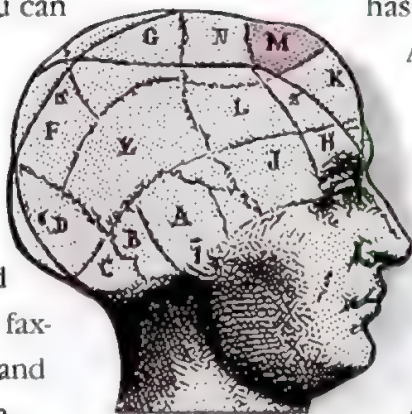
Which means you can easily fax from within even the most powerful, memory-hungry applications.

8. If you need help while you're faxing, just press F1 and follow the built-in directions.

9. Our board is covered by a 5-year warranty—more than twice as long as cheaper fax boards. (We'll leave it to you to figure out what that implies.)

10. No other fax board is designed to run crash-free under Windows 3.0. Just load *FAXit® For Windows* software—which, by the way, is free to all SatisFAXtion buyers—onto your PC, and you can fax directly from any Windows 3.0 application that can print.

11. What more could we add to the fax board that



has everything?

Actually, quite a bit: For a limited time, when you buy the SatisFAXtion board you'll also get *PC Tools Deluxe™* software free, as well as \$100

worth of discounts on other PC hardware and software products.

If you'd like to learn more—and believe us, there's plenty more to learn—just

call (800)525-3019 and ask us to fax you document #9996. Or call Intel customer service at (800)538-3373.



We think you'll find that the difference between a cheap fax board and an inexpensive one can really be summed up in one word: SatisFAXtion.



intel®

© 1990 Intel Corporation
SatisFAXtion and WYPIWYF are trademarks of Intel Corporation. FAXit is a registered trademark of Alien Computing. PC Tools Deluxe is a trademark of Central Point Software.

CIRCLE 374 ON READER SERVICE CARD

Shelling out an extra \$10,000 for a Compaq SystemPro with chancey service is appalling. With that kind of iffy support, they should be paying you the ten grand.

On the other hand, Dell's i486™ servers come with the same service that's won an unprecedented 8 PC Week Corporate Satisfaction Polls for PCs, laptops and servers.

Spend less. Get more. Sounds better, doesn't it?

We have two new i486 EISA servers.

Dell gives you a choice of the 25 MHz Dell® 425TE and the 33 MHz Dell 433TE.

The 25 MHz Dell System® 425TE has up to 64 MB of RAM capacity, 11 storage bays, and a

TO ORDER, CALL
800-284-7766
IN CANADA, CALL 800-867-5752
HOURS: 7 AM - 7 PM (T.M.F.) - 5 AM (T.M.F.) - SAT

whisper-
quiet 300
watt power

supply. We've also built in features such as password protection, a software controlled reset switch, and an efficient cooling system to protect component life.

What's more, both the 433TE and the 425TE have the Dell designed SmartVu™ diagnostic display built in. This ingenious innovation helps identify problems even if the monitor goes down.

For even more performance, the 33 MHz Dell System 433TE is everything our 425TE is, with 32% more speed. The Dell exclusive memory design with a 128 KB external cache gives it maximum throughput.

APPEALING.



\$12,199
Dell System 433TE
Lease: \$438/mo.*

\$9,999
Dell System 425TE
Lease: \$359/mo.*

THE NEW DELL SYSTEM 433TE 33 MHz EISA i486 AND 425TE 25 MHz EISA i486.

Standard features

- Intel® i486 microprocessor running at 33 MHz (433TE) or 25 MHz (425TE) with 8 KB internal cache
- 128 KB external cache (433TE)
- Standard 4 MB of RAM*, expandable to 64 MB (eight internal SIMM sockets, each accepting a 1 MB, 2 MB, 4 MB or 8 MB SIMM, installable in matched pairs)
- Socket for WEITEK 4187 math coprocessor
- 11 internal half-height drive bays
- Eight 32-bit EISA expansion slots (six EISA master slots and two EISA slave slots)
- High-performance IDE (80 MB, 100 MB, 190 MB) and ESDI (330 MB, 650 MB) hard disk drives

650 MB VGA Color Plus System
Using 4 MB SIMMS
433TE 425TE
\$12,199 \$9,999
Prices listed include 8 MB of RAM



AD CODE 11B99

APPALLING.



■ **From this foundation, create a powerful PC network or UNIX® workgroup.** Dell's new systems have more than enough performance to function as a LAN Server and WAN or internetworking gateway. So they're capable of supporting

The Dell System 433TE and 425TE are Class A devices sold for use in commercial environments only. Performance Enhancements. Within the first megabyte of memory 384 KB is reserved for use by the system to enhance performance. All Dell systems are photographed with optional extras. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. **Payment based on 36-month, open-end lease. Leasing arranged by Leasing Group, Inc. In Canada, configurations and prices may vary. Dell and DELL SYSTEM are registered trademarks and SmartVu is a trademark of Dell Computer Corporation. Intel is a registered trademark and i486 and 486 are trademarks of Intel Corporation. UNIX is a registered trademark of AT&T in the United States and other countries. Other trademarks and trade names are used to identify the entities claiming the marks and names or their products. Dell Computer Corporation disclaims any proprietary interest in trademarks and trade names other than its own. From Compaq July 23, 1990 press release. Xerox on-site service may not be available in certain locations. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of Dell's 30-day Total Satisfaction Guarantee, limited warranty, and Xerox's Service Contract please write to Dell USA Corporation, 9505 Arboretum Boulevard, Austin, Texas 78759-7299, ATTN: Warranty. © 1991 Dell Computer Corporation. All rights reserved.

the most demanding server use—a multi-function network. Of course, they're completely compatible with all major network operating systems, including Novell, 3COM, Banyan and LAN Manager.

The 425TE and 433TE are perfect for UNIX® workgroups, supporting either character-based, multi-user or graphical-based client/server environments. You can buy Dell servers preloaded with UNIX System V, making them literally plug and play. Even more impressive is the fact that UNIX system administration can be done by Dell, remotely.

Maintaining servers can be beyond most computer repairmen. If a server goes down, your whole company can go down with it.

Would you trust some unknown technician to bring it back up? We wouldn't.

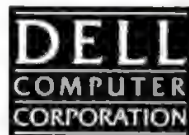
That's why we have a special advanced systems hotline so you can call us direct. Dell is an AT&T UNIX source code licensee and an authorized Novell Network Reseller.

On those rare occasions we can't fix it over the phone, Xerox® technicians will come to your office with the solution in hand.

There's a lot to know before you buy a server.

When you call Dell, our experts will give you the help you need to buy an advanced PC or UNIX server. Then we'll send it off with a 30-day no questions asked money back guarantee, and a one year limited warranty.

So call us. Unless you find appalling appealing.



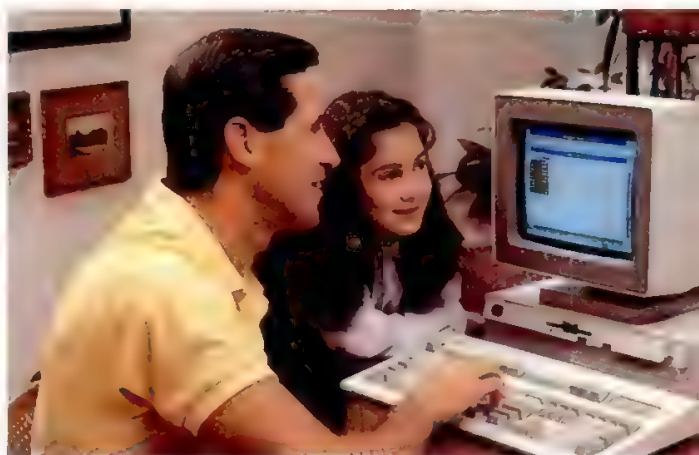
CIRCLE 470 ON READER SERVICE CARD

Field Advantage.

Wherever you are,
pcANYWHERE IV gives you the competitive edge.



pcANYWHERE IV's remote computing plus terminal emulation capabilities keeps your team together - in the field or office. Use it to share information, provide help, explore options - maintain the competitive edge - from remote site to office and back again.



pcANYWHERE IV even gives you field advantage at home. Use it to access on-line services to finish research for month end reports. Answer electronic mail. Forward reports right to your boss' computer.



If a late night flight has you in a hotel room without critical files, don't worry. Keep your field advantage with a laptop and pcANYWHERE IV's bi-directional high-speed file transfer. Get the information you need directly from your office PC.



Next morning you can be on-site, inputting real-time information. pcANYWHERE IV will transmit results of your visit instantaneously to headquarters. Chat on-screen with people at the office. Print updates on your boss' printer. pcANYWHERE IV gives you the field advantage to make things happen.



Enhanced Performance Remote Computing

1776 East Jericho Turnpike, Huntington, NY 11743 (516) 462-0440

All names, products and services are the trademarks of their respective owners.

CIRCLE 332 ON READER SERVICE CARD

Bill Machrone



A Day (or Two) In the Life

Presentation graphics can be a lifesaver, even if you have to lose a little sleep.

Thursday morning at nine o'clock, as my day begins, my boss calls. "We're having the final meeting on your budget next Wednesday. We need a really good presentation on those productivity issues you mentioned in our last meeting."

Swell. I thought I'd said everything that needed to be said. Evidently I hadn't made my points quite as eloquently as I'd imagined. How was I going to get them across with more impact?

Thursday, 10:00 A.M. I marshal my troops for a bit of brainstorming on ways to quantify the productivity issues and to justify the budget requests we're making. My department heads will give me some key figures and some historical research on expenditures and productivity. I'll put the presentation together. We decide to use a presentation graphics package, a first for us. Like the shoemaker's children, we

rarely use PCs for internal presentations.

Thursday, 2:00 P.M. We want to use a Windows-based presentation package for the convenience of moving and resizing objects, as well as for its superior preview and on-screen presentation capabilities. Plus it'll look great on our big 35-inch Mitsubishi monitor. I rummage around my office and come up with a beta version of *Persuasion*, a shrink-wrapped copy of *PowerPoint*, and the disks (no documentation) for *Charisma*. This job has its benefits, I think idly to myself. I settle on *PowerPoint*, based upon the availability of documentation, if nothing else. Now then, where to install it? There's no time at the office, and no room on my home system. I need a portable with 512K VGA memory so I can run a 256-color driver. We want this to be an impressive presentation, and dithered backgrounds are out of the question.

Thursday, 5:12 P.M. I walk into PC Magazine Labs and spot a pair of Ergo Bricks, resplendent in their dark gray speckle paint, like matching granite book ends. Each 20-MHz SX machine sports 8 megs of RAM, a 212MB Conner hard disk drive, and 512K of VGA

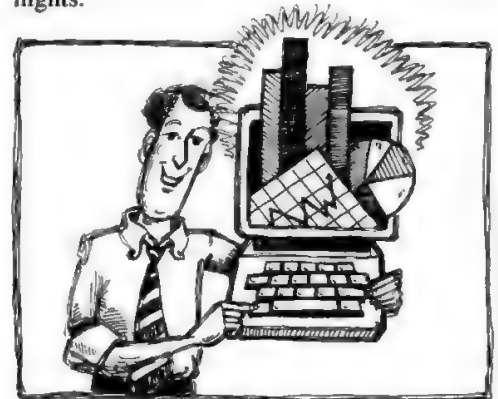
memory. This job *definitely* has its benefits.

Thursday, 9:18 P.M. The kids are finally in bed, and I settle in for a long evening in front of one of the Bricks. I load *PowerPoint*. When it gets to the point where it asks, "Build Bitstream Fonts for LaserJet Printer?" I blithely answer yes.

Thursday, 10:43 P.M. The Brick is still building fonts. Won't make that mistake again. But at this rate, at least I'll get to watch the late news.

Friday, 12:23 A.M. Gotta get some sleep. After all, tomorrow is another day, and it's already here. As I drift off, I realize that we have *PC Magazine* logos in a variety of file formats in the art department. I resolve to get one. It'll look great with a drop shadow in the lower corner against a blue wash.

Friday, 5:45 P.M. The day has been a process of interruptions interrupted by more interruptions. By the time I get to the art department, everyone who knows about logo file formats is gone. I've got the weekend to familiarize myself with *PowerPoint*. In practical terms, that translates to a couple of hours after the kids are asleep on Friday and Sunday nights.



Monday, 10:30 A.M. I realize that I can't import the art department's .PCX version of the logo directly, but need to get it onto the Windows Clipboard. I display the file under *Charisma*, and cut it. Inside the clipboard, the word "Magazine" has disappeared from the logo. I pick the right font, add the errant word, and save the clipboard onto a floppy disk. Tonight I'll build a new background on the Brick in my den.

Award Winning LAN Accounting Software Your Best Buy!



Reviews are in and Pacioli 2000 accounting software has surpassed all expectations. It has been honored by PC World as the "Best Buy" in 1990 and COMPUTE's Choice Award as Best Financial Software of 1991.

Designed by J. M. Hurtado, who started the accounting software revolution in 1985 with DacEasy Accounting, Pacioli 2000 is the FIRST full-featured, network-ready accounting software for only \$49.95. It gives you everything you need while saving you hundreds, even thousands of dollars over other software.

New York Times, July 1, 1990
"...the equal of other high end accounting programs in every way but cost."

With all its power, pull-down menus, full mouse support and context-sensitive help, Pacioli 2000 is as easy to use as a check-writer. You get examples, guides, suggestions, an automatic installation routine, and a file inquiry system that lets you make inquiries or create accounts "on the fly."

Computer Reseller News, April 23, 1990
"...a full-featured package that adds the extra element of network support."



ONLY
\$49⁹⁵

Pacioli 2000 integrates 8 modules into one single powerful system: General Ledger, Accounts Receivable, Accounts Payable, Inventory Control (including true FIFO and LIFO), Billing, Purchasing, Budgeting and Auditing. Learn one and you've learned them all.

Pacioli 2000 is fully networkable so that one user or any number of users can enjoy the same easy-to-use, powerful features with no additional fees.

Pacioli 2000 also gives you FREE unlimited technical support by telephone or FAX. And, it is backed by a 90 day money-back guarantee (less shipping charges) when purchased directly from M-USA.

PC Week, August 27, 1990
"...the best software value of the year."

Now, there are two outstanding offers included with your purchase of Pacioli 2000. When you send in your registration card, you can order Pacioli 2000 Payroll absolutely FREE. You can also order a FREE 2-hour instructional videotape to help you learn MS-DOS, Basic Accounting and Pacioli 2000. With each offer you pay only for shipping and handling.

We believe Pacioli 2000 is the best accounting software value available and the critics obviously feel the same way. We are confident that when you try it, you will say, "Yes, Pacioli 2000 is the Best Buy!"

M-USA
BUSINESS SYSTEMS, INC.

For More Information Call 1-214-931-2033
TO ORDER CALL OPERATOR 239
1-800-345-4243

or mail the coupon below.

Yes! Please send me _____ copies of Pacioli 2000 for only \$49.95 each (Add \$7.50 for shipping and handling. Texas Residents add 8.25% sales tax).		Payment Method, Check One! No CODs please. ☐ Check ☐ Visa ☐ MC ☐ AmEx	239
Account # _____ Expires _____ Signature _____		Make check payable to and mail to: M-USA Business Systems, Inc. 17440 N. Dallas Parkway, Suite 207 Dallas, Texas 75287	
Name _____ Address _____ City _____ State _____ Zip _____ Phone No. _____ Amount Enclosed _____		Minimum Hardware Requirements: IBM or compatible computer with 640Kb. hard disk, monochrome or color monitor, mouse optional. MS-DOS 2.1 or later for single users (3.1 or later for networks). 132-column dot matrix printer in compressed mode.	

© Copyright 1991, M-USA Business Systems, Inc. Pacioli 2000 is a trademark of M-USA Business Systems, Inc. All others are trademarks or registered trademarks of their respective manufacturers. All specifications and offers are subject to change without notice.

CIRCLE 136 ON READER SERVICE CARD

Bill Machrone

Monday, 3:30 P.M. I've got all the facts and figures from my department heads, and they support our assumptions. I begin work on the presentation by loading the values into a spreadsheet.

Monday, 9:10 P.M. I set about building a background for the presentation. The red portions of the logo have turned white. The white portions have turned red, and the word "Magazine" has turned black. Sigh. Too late to fix them now, and the budget guys will never notice.

Monday, 10:00 P.M. I bring the spreadsheet into PowerPoint, and begin experimenting with different graph types to see which ones tell the story best. I merge the graphs with the bullet points I created over the weekend. Little by little, the presentation is taking shape. This is beginning to be fun.

Tuesday, 1:45 A.M. The fun has to end some time.

Tuesday, 9:30 A.M. I'm in the Labs, seated at the other Brick. I begin running through the presentation, sharpening it, adding things, making the points crisper. One of the key graphs would tell its story better if I changed the order of two of the rows in the spreadsheet. I double-click on the line and I'm back in spreadsheet mode. Another couple of clicks, and I've swapped the two rows. I go back to graph mode, and all my data is crunched into a skinny line at the far left of the x-axis. Various remedies fail. I panic. I call Microsoft tech support.

Tuesday, 12:40 P.M. I've been on hold so long that I must violate a cardinal Labs rule and eat a bag lunch at the test bench. Would've starved otherwise. Like the *deus ex machina* of the old Greek plays, a Microsoft PR person comes strolling by my bench at that very moment. She'd been demonstrating the new version of Excel. She listens to my plight, hangs up my phone, and calls the PowerPoint product manager. Forty-five minutes later, my problem is solved. I also learn the trick of changing the errant colors in the logo.

Wednesday, 9:00 A.M. I give the presentation. By this time, I'm totally bored with it, convinced that the points I'm making are trivial and that the presentation is essentially content-free. The budget committee, however, is blown away. Maybe there's something to this presentation graphics market after all.

Connect With A Winner

The Pocket LAN Adapter



Product of the Year—Portable Networking 1989

"It's the perfect way to link portables to a LAN."



Best of Show—Fall Comdex 1989

"Makes it vastly easier to connect systems—especially portables—to LANs."



Product of the Year 1989

"Xircom's Pocket LAN Adapter is a simple solution to a nagging problem."



Award for Technical Excellence—Design 1990

"Xircom delivers in the smartest, most stylish manner imaginable."



Product of the Year—1990

"Xircom was the first—and its products are still the best—for connecting any portable computer to a network."

Xircom
Simply Expanding Connectivity

26025 Mureau Road
Calabasas, CA 91302 • 818/884-8755
De Lescluzestraat 63 • 2600 Antwerp, Belgium
32(0)3 281-06-46

Xircom is a registered trademark of Xircom, Inc. Pocket LAN Adapter is a trademark of Xircom, Inc. All other marks mentioned herein are trademarks of their respective companies. © 1990 Xircom, Inc.
CIRCLE 211 ON READER SERVICE CARD



ZEOS 386SX

**The Incredible ZEOS 386SX
Editor's Choice System.
Loaded as you like it!
Complete 16MHz ZEOS 386SX.
ONLY \$2295.
20MHz add only \$300.**

It's what everyone wants. Our Editor's Choice 386SX system loaded with features. Now Available in 20MHz! Both loaded with savings and ready to ship to you today!

- Genuine Intel® 80386SX-16 CPU, 8/16MHz; or Intel 80386SX-20 CPU, 8/20MHz.
- 2MB of Zero-Wait DRAM, expandable to a System Total of 16MB.
- 85MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit VGA 1024 color graphics card with 512K RAM!
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port.
- 6-16, 2-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS SuperCase with two cooling fans for added reliability and product life.
- Six drive bays and our custom 200 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Computers Now! SM

RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 today! We've built up an extra supply of the hottest selling computers in America—the ZEOS 386SX-16 and 20MHz *plus* the ultra-fast ZEOS 386DX-25 and 33MHz thunderbolts. Hot systems *ready now!*

Take your pick! All four of these '386 Color VGA screamers come packing a high capacity high speed hard drive, tons of memory, two floppies *plus* all the other goodies. And they're ready to ship. *Right Now!*

Here's how it works. We have these incredible ZEOS '386 Color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time.
2. Credit Cards are subject to authorization.
3. Orders must be for ZEOS '386 systems configured as shown here. Any other systems or upgrades are custom built and will take slightly longer.

***OUR GUARANTEE TO YOU:**

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any '386 systems. They're high performance, high quality ZEOS '386 systems. Packing all the ZEOS '386 value that has won PC Magazine Editor's Choice—*four times!*

But the real winner is you! Compare price, performance, quality and features. You'll see why PC Magazine selected ZEOS '386 systems "For Overall Excellence" above all others. But don't stop there.

How about *24 Hour A Day Toll Free Technical Support*. It was ZEOS who invented 24 Hour a Day Toll Free Support (it's an idea others have since copied but haven't matched). Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty, Express Replacement Parts Policy and Customer Satisfaction Package. You'll love it all. Almost as much as your new system.

So give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.

Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations. 386 and 386SX of Intel Corporation; Microsoft, MS-DOS and Windows of Microsoft Corporation, IBM and PS/2 of IBM Corporation; ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company. NASDAQ symbol: ZEOS



ZEOS 386-25

**Complete 25MHz ZEOS '386.
64K Cache, 4MB RAM, 124MB
Drive, 1024 VGA Color and
more!**

ONLY \$3195.

Power packed and ready to go! Order it UPS Red and this 25MHz Racer can be on your desk tomorrow!

- Genuine Intel® 80386-25 CPU, 8/25MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 64K SRAM Cache. Vastly superior to page/interleave memory schemes.
- 4MB of High Speed DRAM, expandable to a System Total of 16MB.
- Ultra Fast 124MB IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit VGA 1024 color graphics card with 512K RAM!
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O Card with two Serial, one Parallel & one Game Port.
- 1-32, 6-16, 1-8 bit expansion slots. 80387 and Weitek math coprocessor support.
- Rugged 5-bay ZEOS case with 250 Watt TurboCool® power supply for increased component life and system expandability.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.



ZEOS 386-33

**Loaded ZEOS '386 33MHz
Screamer. 128K Cache, 4MB
RAM, 124MB Drive, 1024 VGA
Color and more.**

ONLY \$3695.

Government Computer News calls it "Arguably the fastest MS-DOS and OS/2 micro in the world." Your 33MHz '386 Screamer in our 8-bay Vertical case!

- Genuine Intel® 80386-33 CPU, 8/33MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 128K SRAM Cache.
- 4MB of Zero-Wait DRAM, expandable to a whopping 32MB on the motherboard.
- 124MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit VGA 1024 color graphics card with 512K RAM!
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O Card with two Serial, one Parallel & one Game Port.
- 2-32, 6-16 bit expansion slots. 80387 and Weitek math coprocessor support.
- Rugged ZEOS 8-bay vertical case with two cooling fans for added reliability and increased component life.
- 250 Watt TurboCool® power supply by PC Cooling. Nobody gives you this much!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

**ZEOS. Fast
Delivery, Great
Systems! A Few
Expert Opinions:**

■ PC Magazine,
On the ZEOS
386SX, "With so
much going for it,
how could you
go wrong?"

■ PC Magazine,
On ZEOS '386
systems, "Out of
104 Machines...
For Overall
Excellence we
selected ZEOS
International..."

■ PC Magazine,
On Zeos '386
Speed, "The ZEOS
blows away every
other computer...
a smart choice."

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders: 612-633-1325
Minnesota: 612-633-4591
Hearing Impaired:
800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, VISA, Am Exp.
Z-CARD and COD
Open 24 Hours a Day.
365 Days a year!



PC-MOS

The Multiuser DOS Platform For The '90s

The 386 and now the 486 microprocessors have focused a lot of attention on the multiuser, multitasking possibilities of advanced PCs. A myriad of software and hardware manufacturers are promising a new age of multiuser options in the '90s.

But when you take a closer look, only one solution focuses on the features you want and anticipates the capabilities you need to use your PCs to their greatest potential. That solution is PC-MOS™ from The Software Link, the first DOS-compatible, multiuser, multitasking operating system.

A Network Alternative

The advantage to the PC-MOS shared processing solution is its ability to maximize the available memory on your PC, taking full advantage of extended memory and sharing it with up to 25 users on inexpensive terminals or monitors. You can share data with the same speed and integrity of a network solution without the expense of network cards and the waste of under-utilized PCs. And no additional investment is required to get the multitasking capabilities inherent in PC-MOS.

A Network Enhancer

For affordable network expansion, PC-MOS servers can be connected to other servers with The Software Link's LANLink or with the PC-MOS

PC-MOS is a trademark of The Software Link. All other products referenced are trademarks of their respective companies. Prices, policies and specifications subject to change without notice.

GATEWAY™ to Novell's NetWare®. This connectivity lets a business configure its automation systems for departmental efficiency and expand affordably as needs grow with LANs or even WANs.

DOS Compatible

The PC-MOS alternative is clear: DOS compatibility means your users can continue to use all the popular software packages. And that means no investment loss, no retraining and no limitations in available applications.

An Unbeatable Solution

The next decade of shared processing will be clouded with choices. Only one operating system was first to offer you DOS-compatible, multiuser, multitasking solutions. Only one operating system continues to provide unbeatable multiuser solutions for over 150,000 users. PC-MOS from The Software Link. Call today and set your computing sights on a more productive horizon.



THE SOFTWARE LINK

1-800-451-LINK

3577 Parkway Lane, Norcross, GA 30092

(404) 448-5465 FAX: (404) 263-6474 TELEX: 4996147 SWLINK

VARs and RESELLERS:

Ask about our Sales Support Program

GSA Schedule/GSOOK 90 AGS6448

CIRCLE 393 ON READER SERVICE CARD



John C. Dvorak



Comdex: Just Say No

Fall Comdex has gotten so big, the entire trade show is out of hand. Our columnist survived his lost week in Las Vegas, but there's got to be a better way to run a show.

Maybe it's just me, but as far as I'm concerned, the Fall Comdex show in Las Vegas was as out-of-control as a show could possibly be.

My nightmare started on the trip to Vegas. The plane was filled with slaphappy showgoers. Many were seasoned travelers who own so-called garment bags bulging on all sides and big enough to hold a corpse. First these guys bash the heck out of everyone on the way to their seats. Then after they find out that the closets are already filled with other massive garment bags, they try to stuff these monstrosities into the overhead bins.

While the baggage struggle creates havoc, there are a couple of those annoying gawkers who never sit down. Instead they awkwardly stand in front of their seat, crouching to

avoid bashing their heads on the overhead bin, and they stare into the back of the plane as though some long-lost buddy was back there maybe in the can or something.

I don't know about you, but I'm always unnerved at people in planes who are always staring into the back looking at everyone. I want to scream, "Hey sit down, you jerk!" These are the same guys who later clog the aisles talking to someone—again while looking toward the back of the plane.

The flight to Vegas was loaded with these clowns. I looked upon this occurrence as a bad omen.

Bad indeed. The town was jammed with people. The gridlock was unbearable. There was no parking to be had anywhere. One large parking lot at the bankrupt Landmark Hotel was closed off so nobody could use it. A great big, "Thanks for nothing" goes to the party responsible for that lack of consideration. Cars were piled up everywhere. In the late forties—as I recall—only a few smart showgoers rented cars, but because of the massive inconvenience of the shuttle system, now everyone rents a car. Vegas desperately needs some kind of people-mover system if it wants to keep appealing to the convention trade. A monorail was already supposed to exist from

the airport to the strip. In the meantime, two huge new hotels—the Excalibur and the Mirage—have been finished, but there are still no signs of a monorail.

Maybe we should let Vegas sink into the sand dunes and look elsewhere for a trade show mecca.

CARE FOR MORE WHINE?

The problem with all this complaining is that it bucks the trend toward mega-events, no matter how inefficient they become. As everyone knows, the trade show phenomenon is a boon to business because it centralizes many necessary sales and marketing functions within a single location and over a short period. What I didn't discuss is the efficiency aspect of trade shows.

There is an optimal size show. I'm not sure what this magical size is, but one thing for sure, Comdex *isn't* it. The show lasts too long, and it's too spread out. There is no way you can efficiently get from point A to point B. The shuttle buses are a delay. There's no parking. The cabs lines are too long. The most efficient use of time is spent after show hours or in unauthorized suites in the hotels.

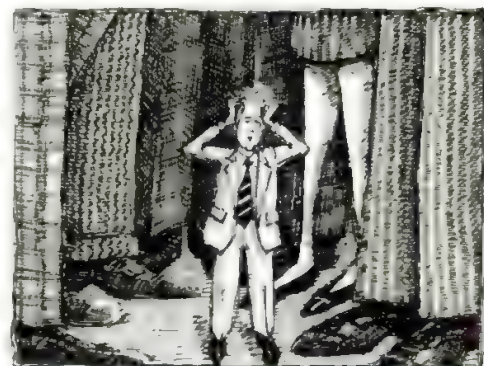


ILLUSTRATION: PETER BONO

The show promoters would love to break up the show into smaller units, but no acceptable formula to do this has been discovered. Meanwhile, the smaller shows like Networld, Spring Comdex, and PC Expo seem to look better and better. It's possible that the Fall Comdex will just fall apart under its own weighty success. To paraphrase Yogi Berra, "Nobody goes to the Vegas Comdex show anymore. It's too crowded."



Unfortunately the Information Age is here.
Fortunately there's a printer that can handle it.



NEC Pinwriter P9300

Another day, another load. More reports, more memos, more forms. In triplicate. You don't just need a bigger in-basket. You need a printer that's fast and reliable. Like the versatile NEC Pinwriter® P9300. With a high-speed letter quality of over four pages per minute, the P9300 is the fastest printer in its price class. And the Pinwriter P9300 can process any business media, from single sheets, envelopes, and six-part forms, to labels and card stock. Extra fonts can easily be added if you find the eight resident type fonts aren't enough. And just pop in a color ribbon for crisp color output. For high volume, optional single and dual bin sheet feeders are also available. And if you find you still have more paperwork than you can handle, perhaps you should consider a shredder. For more information, call 1-800-NEC-INFO.

Pinwriter is a registered trademark of NEC Corporation. ©1989 NEC Technologies, Inc.

C&C Computers and Communications

NEC

CIRCLE 394 ON READER SERVICE CARD

John C. Dvorak

Inside Track

To me, Comdex was symbolized by the reemergence of the Pick Operating System. Finally, Dick Pick has taken a

version of his **legendary** minicomputer environment and launched it on the PC platform as a multiuser database. The three-user version costs \$795 and runs in native mode on the PC—meaning it boots the Pick Operating system and runs its application while bypassing DOS. Call Pick Systems in Irvine, Calif., for more information at 714-261-7425. With versions running on the RS6000 and most minicomputers, this is a database solution that you should examine, especially if you're running a growing company. The **growth potential** is exemplified by a proposed installation in Scotland—a **55-gigabyte system** that spans 200 sites and keeps the health care records of every person in the **entire country on-line!**

Dick Pick told me, "This is what I've been working on for 25 years. A lot of people don't understand what multiuser databases are all about! I can now change from a programmer to a salesman. We're getting 3,500 leads a day at this booth!"

For good reason, besides the software—called *Advanced Pick*—and a **sexy model signing autographs**, the booth had one of the **best song and dance numbers** ever presented at Comdex with a **sprightly rap group** that did a riotous antimainframe song.

This Comdex featured plenty of entertainment with dozens of ministages and **zany presentations**. Take the one produced by Zenith where the guy says the new laptop is only "Nine and one half pounds!" And the girl cries "Ohhhh...that's light!" For a **bulldozer** maybe.

All the screamers and show-biz types added to an **unbelievable din**. This had to be the **noisiest Comdex ever**. It sounded like a rookery during the **mating season**. I thought the steady drone of jack hammers in New York was bad. This was worse.

WordPerfect Corp. had its usual popular presentation, but this year it had a new twist. Instead of the trite baseball caps the company once gave away to anyone who endured the presentation, it gave away a **funny white Pork Pie hat**. Hundreds of showgoers wore the hat around town making them look like **tourists from the planet Cornball**.

Highlight of the Show Dept.: Few attendees could say they saw much that was new. It seemed as though the show was **plagued** by companies that do nothing more than refurbish laser printer cartridges.

The **actual highlight** of the show was an Amiga add-in card called the **Video Toaster** from NewTek of Topeka, Kans., 913-354-1146; for \$1,500 it combines the features of a

video mixer, deck controller, special-effects generator, Chyron machine, genlock master, super video paint program, and

gosh knows what else—all **NTSC broadcast video output**. One of the Ziff-Davis executives asked me who'd buy it ("it's not for the PC") when I described it. After he saw it he said, "I'm buying one!" The fact that it runs on the Amiga just proves my point that we'll all be doing multitasking with multiple machines someday. Besides that, the Amiga can be equipped with a PC board to run PC software if you insist on

one machine for all uses. Whatever the case, the Video Toaster promises to toast dozens of high-end video gear makers into **bankruptcy**. Thanks to innovative hardware and **350,000 lines of assembly language code**, it provides about \$100,000 worth of power.

The **cutest computer "ever"** was at the show. Called the LYNX from Chain-tech Computers of Santa Fe Springs, Calif., 213-944-2291, it was the **size of a small book**. Combined with a small 9-inch monitor this 16-MHz 286 machine sells for \$745 with everything but a hard disk, which is an additional \$300. They had one of these things configured on its side in a tower configuration. It was **hilariously cute**.

I'm sure more than a few people missed one of the most **bizarre products** I've

seen for a long time. Called *Mannequin*, it was a **CAD software package that designed humans!** It was amazing. It was priced at \$699 from Human Cad, 1800 Walt Whitman Rd., Melville, NY 11747; 516-752-3568, fax 516-752-3507.

Promises, Promises Dept.: Sharp and Toshiba were prominent at the show with those color laptops they keep promising. The **Russians** from Paragraph were also there showing off a handwriting recognition system that required you write **3-inch-high letters** to make it work.

Oh, by the way, Sharp finally did what it should have done from the beginning and reintroduced the \$359 **Sharp Wizard pocket computer with a QWERTY keyboard**.

I was amused by the **promotions done at the show**. Comdex itself had set up two or three Comdex souvenir booths where they sold "I Survived Comdex" T-shirts, sweatshirts, mugs, and panda bears. **Anything for a buck**. On the other extreme was the **hapless vendor** who had a biplane flying a huge blue banner around town that was unreadable. I asked a guard who had been outside guarding a door about the plane as it buzzed around, and he said he's been looking at the thing for three days and **still couldn't figure out what it said**. Besides that, perhaps the genius behind this **ill-fated idea** should make a note for future reference: Comdex is an **indoor event!**

Many showgoers
in funny white
WordPerfect hats
looked like
tourists from
the planet
Cornball.

No Other Name Means Value and Performance



EPS Unbeatable Support Service and Warranty!

- 60 Day Money Back Guarantee
- Lifetime Toll-Free Technical Support Hot Line
- 1-Year TRW On-Site Service
- 1 Year Warranty and Express Parts Replacement Policy

EPS Technologies, Inc.
announces
**Individual and
Corporate Financing**
as low as:

\$65.⁰⁰/\$72.⁰⁰
386-20MHz - 386-25 MHz

\$80.⁰⁰/\$134.⁰⁰
386-33 MHz - 486-33MHz

Call your
EPS Computer Consultant Today
Toll-Free 800-447-0921

Rates subject to change without notice.



Terms & Conditions:

- Full 60 day Money Back Guarantee
 - Mastercard, Visa-No Surcharge
 - Allow 2 Weeks for Personal & Business Checks to Clear
 - Individual & Corporate Financing - call for details
- Hours: 8 A.M. - 7 P.M. Mon.-Fri. Central Time
9 A.M. - 3 P.M. Saturdays

System Satisfaction...

an EPS Tradition!

EPS 386-SX 20 MHz

- Intel 80386 SX 20 MHz Microprocessor
- 2 Meg 0 Wait State RAM
- Desktop Case/ 200 Watt Power Supply
- Socketed For 80387 SX Co Processor
- AMI BIOS/ Clock Calendar
- 2 Serial/ 1 Parallel/ 1 Game Port
- Slots 2-8, 6-16 Bit
- Teac 1.2 and 1.44 MB Floppy Drives
- MAXTOR 40 Meg IDE HD (17ms)
- MAXTOR 16 Bit IDE Controller
- EPS Monitor 1024 x 768 .28 Dot Pitch
- Orchid Pro Designer II w/ 1 Meg (1 Meg for 256 Colors)
- 101 Keyboard
- MS DOS 4.01 or 5.0 w/ GW Basics
- 1 Year Warranty/ On Site Service
- 60-Day Money Back Guarantee

\$1,795.00

as low as \$65.00 a month

EPS 386-25 MHz

- Intel 80386 25 MHz Microprocessor
- 4 Meg 0 Wait State RAM
- Desktop Case/ 200 Watt Power Supply
- Socketed For 80387 or Weitek Co Processor
- AMI BIOS/ Clock Calendar
- 2 Serial/ 1 Parallel/ 1 Game Port
- Slots 1-32, 5-16 & 2-8 Bit
- Teac 1.2 and 1.44 MB Floppy Drives
- MAXTOR 80 Meg IDE HD (17ms)
- MAXTOR 16 Bit IDE Controller
- EPS Monitor 1024 x 768 .28 Dot Pitch
- Orchid Pro Designer II w/ 1 Meg (1 Meg for 256 Colors)
- 101 Keyboard
- MS DOS 4.01 or 5.0 w/ GW Basics
- 1 Year Warranty/ On Site Service
- 60-Day Money Back Guarantee

\$2,395.00

as low as \$72.00 a month

EPS Options to Fit Your Exact Needs

- Windows 3.0 w/mouse and full documentationAdd: \$89.00
- EPS NON-INTERLACED MONITOR
1024 x 768 .26 dot pitch, flicker-free.
.....Add: \$175.00
- MAXTOR 80 meg 17ms IDE hard drive on
386-SX 20 MHzAdd: \$175.00
- MAXTOR 40 Meg 17ms IDE hard drive on
386-25 MHzSubtract: \$175.00
- MAXTOR 200 meg 15 ms IDE hard drive on
386-33 MHz.....Add \$495.00
- MAXTOR 80 meg 17 ms IDE hard drive on
486-33 MHzSubtract: \$495.00
- EPS 20 MHz/64K Cache.....Add: \$195.00
- EPS 25 MHz/64K Cache.....Add \$250.00
- EPS 386-33 MHz / 486-33 MHz
256K Cache upgrade.....Add: \$145.00
- EPS Tower option.....Add: \$125.00

EPS 386-33 MHz

- Intel 80386/ 33 MHz Microprocessor
- 4 Meg 0 Wait State RAM
- 128K (25 NS) Static RAM Cache
Expandable to 256K
- Desktop Case/ 200 Watt Power Supply
- Socketed For 80387 or Weitek Co Pro.
- AMI BIOS/ Clock Calendar
- 2 Serial/ 1 Parallel/ 1 Game Port
- Slots 1-32, 5-16 and 2-8 Bit
- Teac 1.2 and 1.44 MB Floppy Drives
- MAXTOR 80 Meg IDE HD (17 ms)
- MAXTOR 16 Bit IDE Controller
- EPS Monitor 1024 x 768 .28 Dot Pitch
- Orchid Pro Designer II w/ 1 Meg (1 Meg For 256 Colors)
- 101 Keyboard
- MS DOS 4.01 or 5.0 w/ GW Basics
- 1 Year Warranty/ On Site Service
- 60-Day Money Back Guarantee

\$2,795.00

as low as \$80.00 a month

EPS 486-33 MHz

- Intel 80486/ 33 MHz Microprocessor
- 4 Meg 0 Wait State RAM
- 128K (25 NS) Static RAM Cache
Expandable to 256K
- Desktop Case/ 200 Watt Power Supply
- Socketed For Weitek 4167 Co Processors
- AMI BIOS/ Clock Calendar
- 2 Serial/ 1 Parallel/ 1 Game Port
- Slots 2-8, 6-16 Bit
- Teac 1.2 and 1.44 MB Floppy Drives
- MAXTOR 200 Meg IDE HD (15MS)
- MAXTOR 16 Bit IDE Controller
- EPS Monitor 1024 x 768 .28 Dot Pitch
- Orchid Pro Designer II w/ 1 Meg (1 Meg For 256 Colors)
- 101 Keyboard
- MS DOS 4.01 or 5.0 w/ GW Basics
- 1 Year Warranty/ On Site Service
- 60-Day Money Back Guarantee

\$4,395.00

as low as \$134.00 a month

Order Toll-Free

800-447-0921

Tech Hot Line

800-526-4258



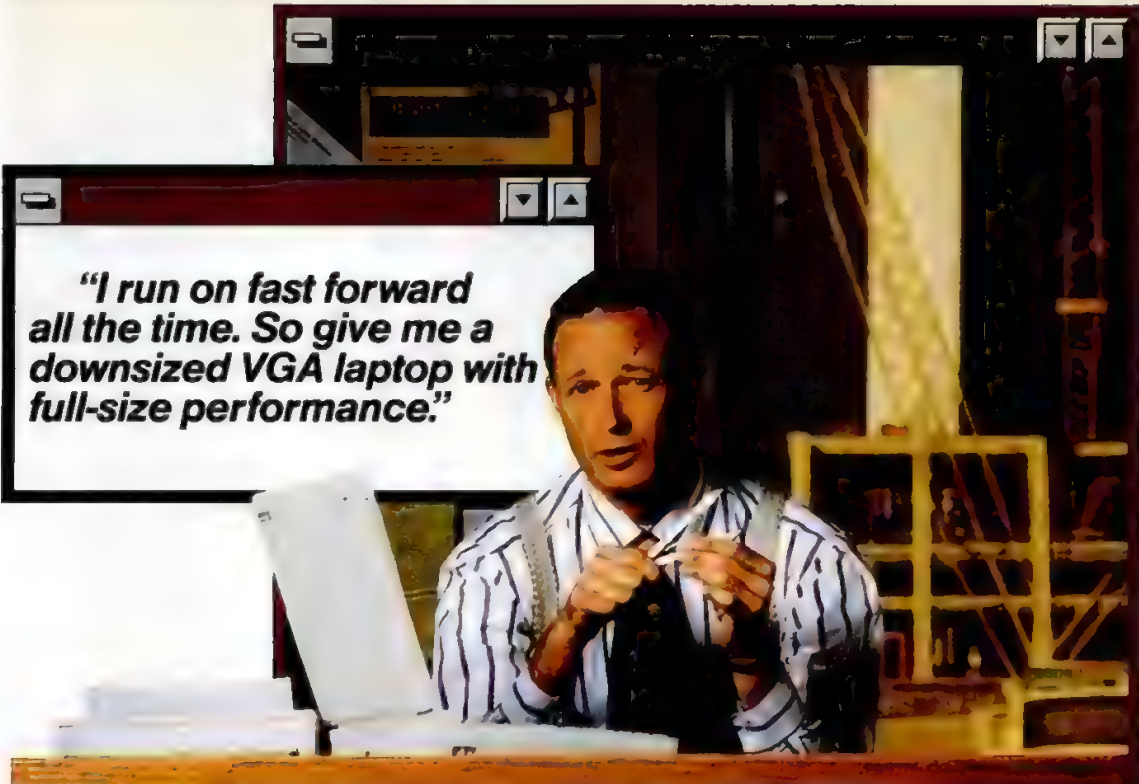
EPS Technologies, Inc.

10069 Dakota Ave.

P.O. Box 278 Jefferson, SD 57038

605-966-5586 / 800-447-0921

FAX Orders: 605-966-5482



**"I run on fast forward
all the time. So give me a
downsized VGA laptop with
full-size performance."**

ZENITH DATA SYSTEMS INNOVATES AGAIN™

The #1 laptop brand in America* brings you the SlimsPort™ 286 laptop PC—for uncompromising 286 power and VGA graphics.

Whether you're just waiting out a layover at LaGuardia or just laying down the groundwork for a new pet project, with SlimsPort 286, you're always ready to hit the ground running. At just 9¼ pounds, it's the perfect full-function laptop for the manager on the run.

It offers VGA video and a backlit, fluorescent black-on-white, full-size LCD display that's ideal for graphical user interface computing. So you'll always have a bright, clear view of the big picture. And with Zenith Data Systems' *Intelligent Power Management™* System, SlimsPort 286 puts power usage in your control so you can extend its 2½ hours of battery life even longer.

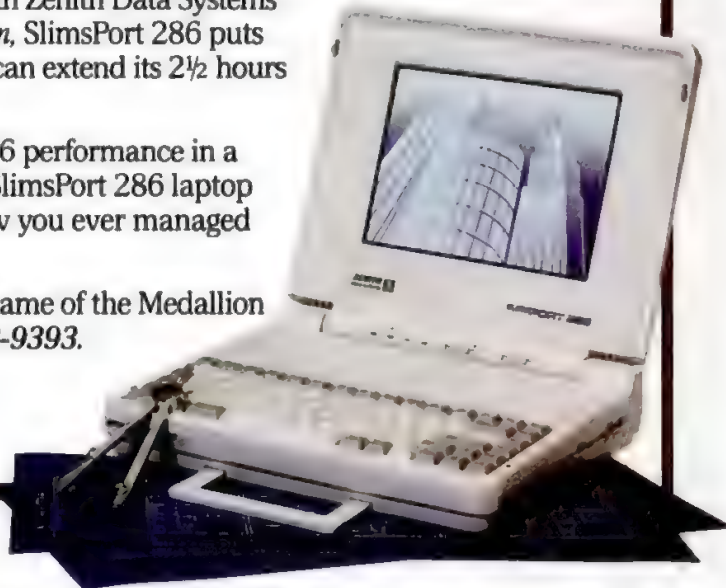
If your job demands full-size 286 performance in a downsized laptop, carry away the SlimsPort 286 laptop PC. Once you do, you'll wonder how you ever managed without it.

For more information and the name of the Medallion Reseller nearest you, call 1-800-523-9393.

ZENITH
data systems



Groupe Bull



*Source: 1990 Dataquest estimate for U.S. battery-powered laptops. Graphics simulate Microsoft® Windows™ version 3.0, a product of Microsoft Corporation. *Intelligent Power Management* is a trademark of Zenith Data Systems Corporation.

©1990 Zenith Data Systems Corporation.

CIRCLE 732 ON READER SERVICE CARD

Jim Seymour



Graphical Isn't Necessarily Better

Every once in a while, we need to look at things in a different perspective. Software is no exception.

Sometimes software developers take us down new roads, with programs that bring not just new approaches to work already common on computers, but bring new *kinds* of jobs to PCs. Sometimes, those new roads lead to hits, and new subcategories of programs are established. More often, we find after a while that there were good reasons no one, or almost no one, was doing that job on a computer, and the new program slips into obscurity.

But these side roads are almost always interesting. And sometimes we discover as we follow them that our perception of how work should be undertaken in the Computer Age is

changed by the trip. That happened to me recently; I think you'll find this excursion interesting.

Vadim Yasinovsky is one of the most interesting characters in the PC software business. A Russian émigré, Vadim still finds things American a bit odd; his questions always make me think. Vadim's first

PC program, *CLEAR for dBASE*, produces flowcharts from *dBASE* code. *CLEAR for C* does the same thing for C-language programs. Both have been well received.

Now Vadim's company is shipping *allCLEAR*, a do-it-yourself flowcharting package. But it faces an uphill job selling its main premise: that flowcharts are widely useful tools, and that people need only see a program like this to recognize that usefulness.

I really like flowcharts. Apart from their uses in programming, decision trees are powerful teaching tools. The clear branching logic of a decision tree makes dealing with the complications of handling customer-service situations, for example, much easier than lengthy text passages.

But persuading people to build their own flowcharts is a hard sell.

INNOVATION: A HARD SELL

Vadim Yasinovsky isn't the first pioneer who's had problems persuading people that his new

software ideas are exactly what they've been waiting for. Dave Winer was way ahead of the market, for example, with *ThinkTank*, the first outlining program for PCs. The program finally achieved modest success, spawned imitators, was sold to Symantec, and reemerged as *GrandView*. But *ThinkTank* also saw its core idea absorbed into many word processing programs, which sharply limited the market for outlining software.

allCLEAR has an interesting twist: Rather than coping with the usual tangled path to a computerized flowchart, you simply build an outline-like list of the points in your flowchart. You add punctuation marks to that outline to handle conditional-logic paths. *allCLEAR* then examines that text file, figures out how it should look—aided by a stylesheet you complete as a parallel file—and constructs the diagram. The system recalls those early PC days when we used text editors, then post-processed their output through text-formatters to get what we wanted onto paper.

I said these ventures into software evangelism can also teach us a lot about ourselves and can change how we think software should work. That happened for me as I worked with

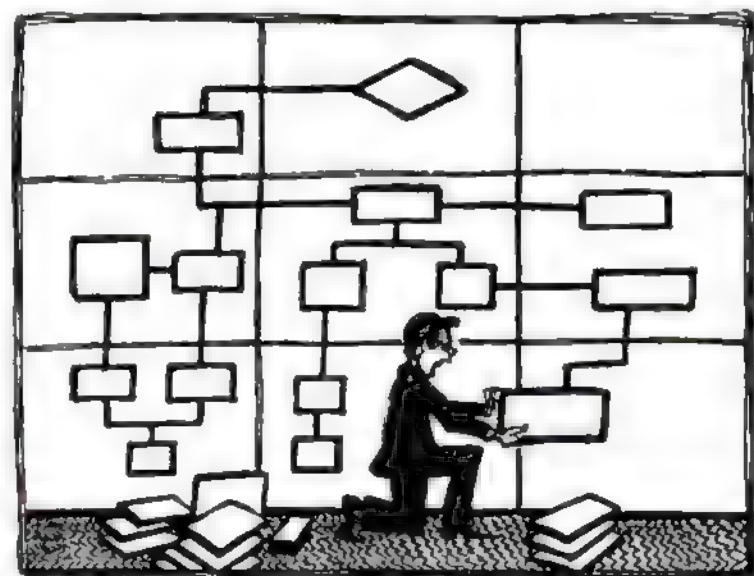


ILLUSTRATION: PETER BONO

allCLEAR, and it arose from that text-file approach to building the chart.

My first reaction to the program, when I heard about it from Dan Bricklin, was that Vadim had gotten things exactly backward. (Bricklin is one of two godfathers of *allCLEAR*; he and Adam Green have helped shepherd it to market.)

Backward? Well, think about a flowchart for a minute. It's an entirely graphical concept:

THINK OF OUR SOFTWARE AS AN ENDLESS SUPPLY OF FREQUENT FLYER MILEAGE.

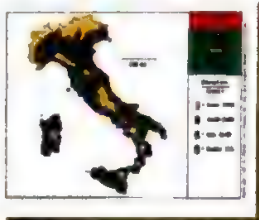
Imagine the possibilities if personal computers could access global information. Not only statistics and facts, but traditional maps and geography. Not only instantly, but easily.

**PC GLOBE,
THE WORLD AT
YOUR FINGERTIPS;
ONLY \$69.95.**

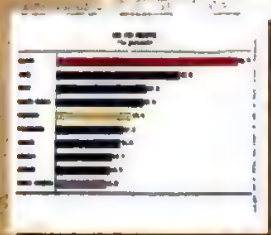
Here, in the efficient space of a few diskettes, is a simple-to-use "electronic atlas" that provides instant profiles, detailed maps and enhanced graphics for 190 countries and dependencies. What would ordinarily take hours to research becomes accessible at the touch of a key.

An almost endless combination of data and comparisons can be displayed via colorful bar charts or on the maps themselves.

Country maps outline elevations, lakes, rivers, mountains and features. World, continent and country maps show city locations. Additional map options allow



invest point-to-point distances and bearings as well as display by political alignment such as NATO, OPEC, etc. All data and maps are updated annually. Programs are available in a range of languages.

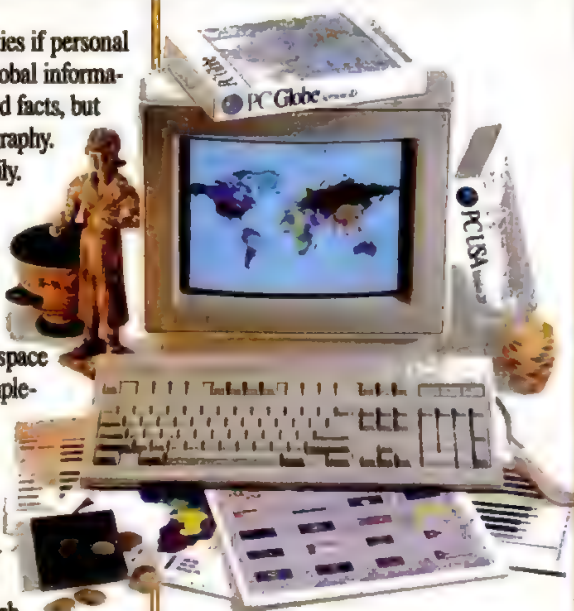


Economic, GNP, import/export, commodity, political, population, health/cultural data may be cross-compared among all countries or regions. Time zones,

dialing codes, visa requirements and language usage are easily accessed. Currency conversions and exchange rates are calculated automatically.

**PC USA, FOR DISCOVERING
AMERICA, ALSO \$69.95.**

Packed with many of the same features as PC Globe, PC USA provides current and historical information for all 50 states and Puerto Rico.



It's as if you could take a tour of the states without ever leaving your desk.

Flags, national anthems and state songs are reproduced in exceptional detail and music. Both programs feature an exclusive "point and shoot" system, simple pull-down menus and compatibility with popular software for creating presentations, graphics and text.



**DESKTOP GEOGRAPHY -
OUR CONTRIBUTION TO AN
EVER-CHANGING WORLD.**

At PC Globe, Inc. we're committed to creating simple-to-use products for global understanding. Because knowing what's where is just as important as knowing what's what.

**AVAILABLE AT YOUR
LOCAL RETAILER, OR CALL US
AT 1-800-255-2789.**



PC Globe, Inc.

4700 South McClintock Drive, Tempe, Arizona 85282
(602) 730-9000 Fax: (602) 968-7196

SOFTWARE FOR EVERYWHERE.

Jim Seymour

instead of reading a lengthy prose description of how something is done, you simply trace your way through a series of boxes, driven inescapably in a good flowchart toward the correct answer.

Given that graphical output, why would anyone develop a character-input flowcharting program? What I want is a Windows-interface program, where I can draw the little boxes, or call them up from a library of shapes and symbols, then drag them into place. And drag them again to revise the chart.

Worse, as Dan told me about *allCLEAR*, I realized this was another of those mode-based programs I hate: You work in one mode which doesn't show your results, then you flip to a print-preview mode...in which you can't edit anything.

Dan told me to wait 'til I got my hands on the product. I'd see.

Five minutes into constructing my first *allCLEAR* flowchart, I understood what he meant. Using a graphical-interface product would be fun, but foolish: I'd be forfeiting the power of the computer to figure out where to place each box, how to get them onto one sheet of paper, how to scale boxes and text and arrows.

I'd been through that before: I used to make org charts on the Mac with *MacDraw*. The results were elegant, but agony to produce.

Precisely because *allCLEAR* abandons graphical input, and asks users to rely on its own smarts in laying out a chart, *allCLEAR* is a far more powerful tool than a do-it-all-yourself drawing program.

I don't think *allCLEAR* is going to have an easy time of it in the market: There's a lot of missionary selling to do on this one. And the program's far from perfect: It has a cluttered interface, handles soft-font downloading clumsily, and doesn't format output as cleanly as it should.

But Yasinovsky taught me an important lesson about how software *ought* to function, and about questioning my assumptions.

Not everything needs to be graphical. At least, not until someone figures out how to bring the power of programs like *allCLEAR* into a graphical-input system.

It's nice to be able to see what you're doing. But it isn't very smart to do the grunt work yourself: That's what computers are for.



The IBM AS/400 is designed and built to meet the most important standard for quality there is. Yours.

When we first set out to build the IBM AS/400® computer system, Congress had not yet established the Malcolm Baldrige National Quality Award.

Yet our goals for the AS/400, and our feelings about quality, turned out to be in solid accord with one of the Baldrige Award's guiding principles: that quality is defined not by the people who make a product, but by the people who use it.

From the very start, we've included customers in the AS/400's design process. Hundreds of people from companies of every size and type have told us what they want, and don't want, in a computer system.

But more important, we've

learned as much about their *business* needs as we have about their computer needs. As a result, the AS/400 is renowned as a system that works your way, instead of you having to work its way. Which is one reason our level of customer satisfaction is virtually 100%.

Needless to say, we're thrilled to have won the 1990 Baldrige Award, and we congratulate the IBM people in Rochester, Minnesota, who design, build and support the AS/400. But we also congratulate our customers. Without their help, we couldn't have done it.

To learn more about the AS/400 and the IBM quality story, call us at 1-800-365-4 IBM.



TELEMARK

Where smart buyers find smart buys.

"I want to thank and commend you for your prompt service and excellent prices. I will continue to do business with you for my future computer needs."

P. Treleven
Lansing, Michigan
March 20, 1989

TERMINALS

Wyse	
30 Amber	\$289
50 Amber	\$369
60 Amber	☎ 289
85 Green	355
150	275
160 Amber	339
185	355

LOWEST PRICES

Industry Price Leader.

TAPE BACKUP

Colorado Memory System	
Jumbo 40/80 EXT	\$389
Jumbo 40/80 INT	☎ 245
Irwin	
20 MG Internal	229
40 MG Internal	349
80 MG Internal	439

BEST SELECTION

We have the product you want.

DISKETTES AND TAPES

Sony	
3.5 D/S D/D Case Disks	\$75
3.5 H/D (Case Only)	145
5.25 D/S D/D Disks (100)	50
5.25 High Density (100)	90
Sony Tape	
150 MB/5.25	20
20-40 MB/3.5	15
60 MB/5.25	19

"I am writing to you to tell you that the service was very fast and much appreciated. I would also like to say that you should be proud of the people working for you because they are super employees."

J. Ounan
Millsboro, Delaware
April 23, 1990

BOARDS

AST	
RAMPAGE + 286W/512K	\$385
Six Pack 384K	219
All Other Models	Call
ATI	
VGA Wonder + 256K w/Mouse	189
VGA Wonder + 512K w/Mouse	225
Everex	
RAM 3000 Deluxe	☎ 79
RAM 8000	175
Hercules	
Color Card	100
Graphics Card Plus	175
All Other Models	Call
Intel	
Above Board + 512K Plus	329
Above Board + w/2MG P/S	525
Above Board + w/2MG	
Expands to 8 MG	499
Inboard 386 PC (1MG)	489
All Other Models	Call
Orchid	
Tiny Turbo 286	205
Tiny Turbo Xtra	259
All Other Models	Call
Paradise	
VGA + 256K	135
VGA + 16	179
VGA 1024 512K	239
Plus	
Hard Card II XL50	379
Hard Card II XL105	649
Hard Card II 40 MG	349
Hard Card II 80 MG	569
Video 7	
Fastwrite VGA	149
1024 I w/256K	175
All Other Models	Call

PC Globe, Inc.



Instant profiles and detailed data for 190 countries.

\$35

CO-PROCESSORS

Intel	
80287-XL	\$189
80387-16	329
80387 SX-16	☎ 299
80387-20	375
80387-25	469
80387-33	579
8087-1	155
8087-2	119

KEYBOARDS

Keytronics	
KB5151	\$115
KB5153	145
KB101Plus	☎ 85

telemart

EXTENDED HOURS

Mon.-Fri. 6:00 am-10:00 pm MST
Sat. 8:00 am-5:00 pm MST
Sun. 10:00 am-3:00 pm PST

"I'm impressed - I'm impressed! I had a problem, you corrected the problem. Your service is the best in the business! The direct marketing side of the computer revolution needs more companies like you!"

M. Thomas
Washington, D.C.
October 21, 1987

OCR/SCANNERS

HARDWARE

Complete	
400 Hand Scan	\$145
Full Page	515
Half Page 400 DPI	169
DFI	
Scanner HS-3000+	☎ 150
Logitech	
Scanman + XT/AT	169
Scanman + PS2	212

SOFTWARE

CAT Reader Pro 1/2 Page	☎ \$159
CAT Reader Pro Full Page	225
Complete OCR/FP	289
Complete OCR/HP + 400	175
DFI OCR	45
DFI OCR Deluxe	125

MOST RELIABLE

10 Years of Mail Order Excellence.

MICE

Kensington Expert Mouse Bus	\$110
Kensington Expert Mouse PS/2	95
Logitech Serial Mouse	
New Hi-Res XT/AT	☎ 67
Logitech Bus Mouse	
New Shape Hi Res	74
Logitech Serial Mouse w/Windows	139
Logitech Serial XT, AT Finesse Bundle	109
MS Bus or Serial Mouse 1.0	97
MS Bus or Serial w/Windows 3.0	145
Microspeed PC Trac Bus	82
Microspeed PC Trac Ser or PS/2	70
Omni Mouse II Bus	55
Omni Mouse II Serial	38
PC Trac Ball Serial	46
PC Trac Ball Bus	64
Trackman Bus	81
Trackman Serial	75

"There's no comparison. I have purchased numerous products from your competitors, wishing now that I had called Telemart. Your quick and efficient service allows me to continue working without the everyday hassle. Thank you!"

L. Perkins
Provo, Utah
November 9, 1990

PRINTERS

ALPS	
Allegro 500	\$315
All Other Models	Call
Canon	
LBP-4 Laser	919
LBP-8 Laser	1479
Citizen Printer	
1200	135
1800	149
200GX	165
GSX 140	305
HSP 500	315
All Other Models	Call
Diconix	
150 Plus	335
Epson	
FX 850	280
FX 1050	439
LQ510	280
LQ850	445
LQ1050	639
LQ2550	935
LX810	169
7000 Laser	909
7500 Laser	2299
All Other Models	Call
Hewlett Packard	
Laser Jet IIP	999
Laser Jet III	1839
All Other Models	Call
IBM	
Pro Printer II XL	345
Pro Printer II	275
NEC	
LC260	1899
LC290	2525
P3200	275
P3300	385
Okidata	
182 Turbo	230
320	315
321	445
390 Plus	469
391 Plus	599
393 Plus	1085
All Other Models	Call
Panasonic	
1124	285
1180	149
1191	239
1624	385
1695	419
4420 Laser	889
All Other Models	Call
Seiko	
Smart Label Printer	159
Star Micronics	
NX 1000 Rainbow	195
NX 1000 Ver. 2	139
NX 1500	289
All Other Models	Call
Texas Instruments	
Micro Laser Postscript 35 Font	1849
Micro Laser 17 Font	1349
Toshiba	
Page Laser 6	955
All Other Models	Call

FONT CARTRIDGES

Pacific Data 25 IN 1 III	\$259
Pacific Data 1-2-4 Plus 1 MB	164
Pacific Data Four 2 MB	189

ACCESSORIES

Logical Connection 256K	\$445
Logical Connection 512K	422
Logical Connection Plus	559
Masterpiece	82
Masterpiece Plus	95
Masterpiece Remote	102
Summasketch 12x12 II	335
Summasketch 12x18 Pro II	
4 Button	582
Summasketch 12x18 Pro II	
16 Button	599

A Decade of Experience Delivers



PRICE
A DECADE OF THE
LOWEST PRICES



CONFIDENCE
WE DO NOT CHARGE YOUR CREDIT
CARD UNTIL YOUR ORDER IS SHIPPED



SHIPPING
MOST ORDERS SHIPPED
IN 24 HOURS



CONVENIENCE
EXTENDED HOURS LATE NIGHTS,
SATURDAYS AND SUNDAYS

COMPUTERS

ALR	
Business Velsa 386/33 #101	\$1589
Power Flex 286/40MG	1029
AST	
All Models	Call
Epson	
Equity Portable LT-286e	1799
Equity Portable LT-386sx	2895
Notebook Computer	2599
Everex	
Tempo All Models	Call
Leading Edge	
D2 40 MB	1059
D2 LPS 52 MB	1155
D3 5.25 Floppy	1640
386 SX Laptop	1679
Toshiba	
T-1000 SE	890
T-1000 XE	1319
T-1200 XE	2119
All Other Models	Call

MONITORS

Amdak	
All Models	Call
Goldstar	
12" Amber (1210A)	79
14" CGA (1410)	205
14" EGA (1420)	299
14" VGA (1460)	425
16" VGA (1610)	705
Mitsubishi	
20" 3905 ATK	1559
XC 1410 C EGA	329
XC 1429 C VGA	385
Diamond Scan 14"	495
Diamond Scan 16"	1009
NEC	
Multisync 2A	469
Multisync 3D 14"	659
Multisync 4D	1055
Multisync 5D	2335
Multisync GS-2A	205
Princeton	
All Models	Call
Sony	
Multiscan 1304 HG 14"	669
Multiscan 1302A	595
Zenith	
ZCM 1492	589

HARD CARDS

Plus Development	
IIXL 50	\$379
IIXL 105	649
I180 MG	569
All Other Models	Call

FAX BOARDS

Complete	
4800	\$145
9600	289
Communicator	405
PC Portable Fax	285

MODEMS

Anchor	
1200 B	\$59
1200 EXT	89
2400 B	85
2400 EXT	115
ATI	
2400 ETC INT w/SW	169
2400 ETC EXT	189
Everex	
Evercom 12 INT	49
Evercom 24 INT	105
All Other Models	Call
Hayes	
1200 B	135
2400 B	219
2400 EXT	319
9600V Series EXT	609
All Other Models	Call
Intel	
2400 B Classic	139
2400 EXT	165
2400 PS/2	225
Practical Peripheral	
2400 B	125
2400 INT (w/MNP)	159
All Other Models	Call
Prometheus	
1200 B w/Software	49
1200 EXT Pro Modem	205
1200 G EXT	89
2400 B w/Software	99
2400 EXT Pro Modem	295
2400 G EXT	145
Pro Modem 9600 + EXT	645
U.S. Robotics	
Courier 2400 EXT	265
Courier 2400 E(MNP)	315
Courier 9600 HST w/MNP	569
Zoom All Models	Call

MIT PRODUCTS

286-12 40MB 1MG	\$914
386SX-16 40MB 1MG	1227
386-25 80MG 4MB N/C	1966
386-25 80MG 4MB 64K cache	2134
512K VGA Card	130
Modem 2400B	102
Multi I/O	25
Tactile Keyboard	52

SOUND BOARDS

Creative Labs	
Sound Blaster	\$149
Ad Lib	
Music Synthesizer Card	109

DISK DRIVES

Imega (Bernoulli)	
40 Meg (Dual 20 MG)	\$1739
Beta 88 MG Dual 44	1809
Beta 44 MG Insider	899
All Other Models	Call
Colorado Memory Systems	
Jumbo 40/80 INT	245
Jumbo 40/80 EXT	389
Seagate	
20 MG w/Controller	255
20 MG EXT Drive, For PS-2	239
30 MG w/Controller	279
40 MG w/Controller	335
40 MG 251-1	245
80 MG	585
All Other Models	Call
Teac	
5.25 1.2 MG AT	75
5.25 360K XT	65
Toshiba	
3.5 1.4 MG	75

CD ROM

NEC CD ROM INT CDR-82	\$569
Panasonic	
Worm 940 MB	2199
Storage Dimensions	
All Other Models	Call
Toshiba	
CD ROM RDR w/SCSI EXT	705

1-800-622-6659

NOW ACCEPTING INTERNATIONAL ORDERS - Call our FAX at (602) 944-1510

VARs/Dealers - Call 1-800-537-6753

CORPORATE ACCOUNTS - Call 1-800-752-0561

CIRCLE 206 ON READER SERVICE CARD

PCM22891

BUYERS CHOICE



When you see the ☎ symbol, you're assured these products have been purchased most often by **telemart**'s national customer base.

All these products have been top ranked because you, the buyer, have selected them based on their performance and the **telemart** price.

You'll see the ☎ symbol in each category and know you can make the same smart choice.

GRAPHICS

Deluxe Paint II Enhanced	\$77
Graph In The Box Executive	159
Hot Shot Graphics	150
PC Paintbrush IV	54
PC Paintbrush IV Plus	☎ 105
Printmaster Plus	32

PROGRAMMING & LANGUAGES

MS Basic	
Pro Development System	\$299
MS C Compiler	307
MS Cobol Compiler	555
MS Fortran Compiler	273
MS Macro Assembler	91
MS Pascal Compiler	182
MS Quick Pascal	61
MS Quick Basic	61
MS Quick C	62
Turbo C++	84
Turbo C++ Pro	☎ 193
Turbo Pascal Pro 6.0	189

COMMUNICATIONS

Carbon Copy Plus	\$110
Carbon Copy Plus Host	185
CompuServe Membership Kit	19
Crosstalk XVI	103
Crosstalk Mark4	127
Mirror III 2.0	79
Procom Plus	☎ 63
Prodigy Start-Up Kit 3.1	25
Remote 2 Complete Pkg.	103
Smartcom II	75
Smartcom III	129

TIME MANAGEMENT

Calendar Creator	☎ \$39
Quick Schedule Plus	54
Top Priority	53
Working Hours	53

INTEGRATED SOFTWARE

Lotus Symphony 2.2	\$479
MS Works	☎ 92
PFS First Choice	92
SmartWare II w/Spell Chkr	429

Do A Little Windows Shopping With telemart

Adobe Illustrator Windows	\$279	hDC Windows Express	\$51
Adobe Streamline Windows	222	Informix Wingz	304
Adobe Type Manager Windows	58	Language Master	44
Ami Professional	289	MS Entertainment Pack	26
Asymetrix Toolbook	285	MS Excel for Windows	299
Charisma	320	MS PowerPoint for Windows	305
Corel Draw	366	MS Productivity Pack	38
Crosstalk for Windows	117	MS Project for Windows	425
Current by IBM	213	MS Word for Windows	305
Designer	455	Omni Page 386	569
Dragnet 1.0	79	PageMaker 3.01	489
Facelift for Windows	59	PerFORM	157
Facelift for Windows ValuePak	119	PerFORM Pro	263
Form Base w/Windows	295	Prompt 1.0	74
Form Publisher	135	Read Write Personal	152
Grammatik for Windows	48	Superbase 4	409
hDC FirstApps for Windows	48	Ventura Publisher Gold/Windows	531

WE ACCEPT INTERNATIONAL ORDERS AND CORPORATE PURCHASE ORDERS

PRESENTATION GRAPHICS

Animator w/Graphic Transformer	\$239
Drafix Ultra v4.0	232
Harvard Graphics	☎ 286
Lotus Freelance Plus	311

SPREADSHEET

Lotus 1-2-3 Ver. 2.2	☎ \$335
Lotus 1-2-3 Ver. 3.1	409
Lucid 3-D	54
MS Multiplan	119
Plan Perfect 5.1	255
Quattro	65
Quattro Pro	310
Supercalc 5	290
VP Planner 3D	133

TAX PROGRAMS

JK Lasser/Your Income Tax	\$42
Macintax	58
Tobias Tax Cut	Call
Turbo Tax 1990	☎ 39

PROJECT MANAGEMENT

Harvard Project Mgr III	\$393
Lotus Agenda 2.0	275
Org + Advanced	59
Timeline 4.0	☎ 439

DATA BASE MANAGEMENT

Ask Sam	\$161
Clarion	
Personal Developer	45
Professional Developer	451
Clipper 5.0	499
Data Perfect	259
Dbase III Plus	430
Dbase IV	485
dBXL	132
Foxbase Plus 386	269
Foxbase Plus Single User	182
FoxPro Single User	☎ 431
Oracle Database Add-In	215
Paradox 3.5	499
PFS Professional File	169
Q&A	216
Revelation Advanced	489
R&R Relational Report Writer	145
VP Expert	112

LAN & NETWORKING

SOFTWARE

Above LAN	\$234	Novell Adv NW/286	1876
ACCPAC BPI Network	229	ELS I	508
Artisoft		ELS II	1080
Lantastic 2MBPS Starter	365	Paradox 3.5 LAN	666
Lantastic Ethernet Starter	505	PC Anywhere IV LAN	269
Data Ease LAN 3-Pak	439	Q & A Network Pack	252
Dbase IV Lan	636	R-Base 3.1	466
Foxbase Plus LAN	265	R-Base LAN 3.1	582
Harvard Graphics LAN Server	564	Supercalc 5 LAN Pack	295
MS Excel Exec License Pack	245	WordPerfect Additional User	155
MS Word License Pack	182	XTree Net Advanced	289

HARDWARE

Standard Microsystems		All Other Models	Call
Storage Dimensions		All Other Models	Call
Tlars		All Other Models	Call

UTILITIES

BACK UP

Back It 4	\$70
Central Point Backup	57
Fastback Plus	☎ 109
Norton Backup	93
PC Fullback Plus	47

GENERAL

Check It! 3.0	\$79
Copy II Option Board Deluxe	☎ 106
Copy II PC 6.0	25
Mace Vaccine	59
Norton Editor	47
SPF/PC	143

HARD DISK MANAGEMENT

Disk Optimizer	37
Disk Technician Advanced	91
Fastrax	45
Lotus Magellan	96
Mace Utilities 1990	89
Norton Utilities 5.0	109
Optune	43
PC Tools Deluxe 6.0	☎ 88
SpinRite II	65
XTree	24
XTree Pro	53
XTree Pro Gold	81

LAPTOP

Battery Watch Release II	\$29
Brooklyn Bridge	84
Desklink	96
Laplink Release III	☎ 85
Software Bridge	72
VGA Dimmer	25

MEMORY MANAGEMENT

386 Max 5.1 Windows	\$69
Above Disk + 4.0	55
Headroom	67
Hyper Pad	79
Memory Mate	38
Move 'Em	46
PC-Kwik Power Pak	69
Qemm 386	☎ 53
Qram	44
Super PC-Kwik	44

MENUEING SOFTWARE

1 Dir Plus	\$45
Auto Menu	35
Direct Access	☎ 59
Power Menu	54

PRINT

Go Script	\$88
Go Script Plus	175
Impress	71
Print Q	71
Sideways	☎ 37

MONEY BACK GUARANTEE

Software Only - See Details. *

FORM PROCESSING

Form Filler 3.0	\$79
Formtool Gold 3.0	☎ 53
Formworks w/Fill & File	82
Perform Filler	76
Perform 2.1	88

1-800-622-6659

NOW ACCEPTING INTERNATIONAL ORDERS - Call our FAX at (602) 944-1510

VARs/Dealers - Call 1-800-537-6753

CORPORATE ACCOUNTS - Call 1-800-752-0561

MMC
Member of the Direct Marketing Association, Inc.
"Serving the Direct Buyer"



- No Charge for USA and Mastercard.
- We Do Not Charge Your Card Until Your Order is Shipped.
- You Pay The Ground Shipping 1-10 # \$8.00, 11-20 # \$12.00 (Except Alaska & Hawaii). We Pay the Air Difference and Free Air Applies ONLY to Domestic Orders Over \$100.
- Now Accepting International Orders. Call our FAX at (602) 944-1510.
- International Orders Add 5%.
- Call Before Submitting P.O.'s. Ask for National Accounts.

- All products including D.O.A.'s carry only manufacturer's warranties. We do not honor guarantees, rebates, trial period privileges or promotional programs offered by manufacturers.
- No returns on used or re-ordered product.
- We do not guarantee machine compatibility.
- Machine compatibility disclaimer does not apply to NET Systems.
- Personal & company checks will delay shipping 3 weeks.
- Prices, terms, availability & specifications are subject to change without notice.
- Add 5% for C.O.D., A.P.O. & F.P.O. Orders.

Mailing Address:
Telemart
8904 N. 23rd Ave. Phoenix, AZ 85021
In Arizona Call (602) 944-0482.
Order Line Hours: Mon-Fri 9am-10pm, Sat 9am-5pm, Sun 10am-3pm
Order Processing: (602) 944-1037
10am-3pm Mon-Fri
Money Back Guarantee
Software Only. 30 Days from date of invoice. Refund ONLY on Product Price. Product must be in resalable condition. Call for Return Authorization Number. Must be in original packaging. Software is the latest available version.

PCM22991

"You are the Rolls Royce of mail-order firms! I have told several of my friends about Telemart's low prices. Thank you again for all your help and honesty (a rare trait now-a-days!)"

*E. Rintell
Lawrence, New York
July 18, 1988*

PERSONAL FINANCE

Money Matters	\$49
Quicken 4.0	☎ 37
Tobias Checkwrite Plus	27
Tobias Managing Your Money v.7.0	122
Wealth Builder	132
Wealth Starter	45

EDUCATION & TRAINING

Chuck Yeager Flight Simulator	\$18
Designasaurus II	19
Math Blaster Plus	28
Math Blaster Plus Mystery	28
Mavis Beacon Teaches Typing	30
MS Learning PC DOS	31
MS Flight Simulator	☎ 39
PC Globe, PC USA	35 ea.
Personal Lawyer	34
Reader Rabbit	25
Typing Tutor IV Plus	27
Carmen San Diego	
Where in USA, World,	
Europe, Time	29 ea.
Willi Maker	34
Word Attack Plus	27

telemart

EXTENDED HOURS

Mon.-Fri. 6:00 am-10:00 pm MST
Sat. 8:00 am-5:00 pm MST
Sun. 10:00 am-3:00 pm PST

"Just a quick note to tell you how impressed I am with your company. I can assure you that you have a loyal customer who recommends Telemart to friends and associates with confidence."

*R. Anderson
Eden Prairie, Minnesota
November 18, 1985*

OPERATING ENVIRONMENTS

Carousel v4.0	\$48
Desqview 386	116
MS Windows Ver. 3.0	☎ 91
Q DOS II	34

HOME OFFICE PUBLISHING

Express Publisher v2.0	\$85
Finesse	99
Newsmaster II	44
Newsroom Pro	24
PFS First Publisher	82
Print Shop Dual	35
Publish It! 1.2 w/Design	☎ 132

PROFESSIONAL DESKTOP PUBLISHING

Freedom of Press	\$239
Pagemaker 3.01	☎ 489
Ventura Publishing Pro 2.0	345

DOS

IBM OS/2 1.2 Extended	\$375
IBM OS/2 1.2 Standard	297
MS DOS 3.3	☎ 69
MS DOS 4.01	69
IBM PC DOS 4.01	125

"I called in an order on December 16th and I received the software on December 17th. Needless to say, I was astonished.... Thanks Telemart for the great service."

*C. McCoy
Aurora, Colorado
December 19, 1987*

WORD PROCESSORS

LetterPerfect	\$122
MS Word	209
PC Outline	54
PFS Professional Write 2.2	139
Right Writer 4.0	53
WordPerfect 5.1	☎ 247
WordPerfect Office	80
Wordstar 5.5	209
Wordstar 6.0	264

LIST MANAGEMENT

Address Book Plus	\$43
Label Pro	☎ 44
Labels Unlimited	38
List & Mail	26
List & Mail Plus	36

CAD & ENGINEERING

Auto Sketch 3.0	☎ \$141
Design CAD 3-D	188
Generic CAD 5.0	225
Generic CAD Starter Kit Level II	89
Math CAD	305
Turbo Cadd	67

"I believe your mail order operation is simply the very best of its kind in America. You and your exceptionally proficient, friendly staff provide two of the most important commodities in business today: service and competitive prices."

*M. Christy
Studio City, California
February 21, 1990*

ACCOUNTING

ACCPAC BPI	
AP, AR, GA, INV. Payroll	\$229
ACCPAC Bedford Accounting	147
ACCPAC Easy Gen. Acct.	53
DAC Easy Accounting 4.1	80
DAC Easy Bonus Pack 4.1	124
DAC Easy Payroll 4.1	53
One Write + Acctg. System	159
One Write + Payroll	62
Peachtree III	142
Peachtree III w/Data Query	☎ 210
Profitwise Acct. 10-Pack	129
TimeSlips III	159

GAMES

688 Attack Sub	\$18
Abrams Battle Tank	19
Chessmaster 2100	30
Falcon AT	30
Harpoon	36
Hunt for Red October	19
Leisure Suit Larry I, II, III	Call
LHX Attack Chopper	36
Playroom	25
Red Storm Rising	31
Sim City	☎ 28
Their Finest Hour	36
Trivial Pursuit	24

FREE

FASTEST DELIVERY



FEDERAL EXPRESS
*You Pay The Ground Shipping
We Pay The Air Difference*

"I just wanted to commend you and your personnel on the outstanding service and excellent information you gave when I called to place an order. You guys deserve an award!"

*A. Ginn
Albany, California
February 19, 1988*

Where smart buyers find smart buys.

TELESMART

Finally, The Promised LAN

Oracle Client/Server Systems are open, portable, integrated. And here.

Oracle's integrated family of products lets you take everything you've read about client/server systems in the magazines and put it to use in the workgroup. Combining the economy and flexibility of PCs with the performance and integrity that used to require a mini at the very minimum.

ORACLE is portable. Giving you the widest choice of desktop servers: OS/2, six different

UNIX systems and shortly, both Netware and Macintosh.

ORACLE also lets your existing minis and mainframes act as servers to desktop machines.

ORACLE works with all your existing networks. Or any networks you'd like. Novell Netware 286/386, IBM LANserver, Microsoft LAN Manager, Banyan VINES, TCP/IP, and many others.

And it goes without saying that because ORACLE is open, it supports all the front running front-ends. Including Paradox, Lotus 1-2-3, even Dbase applications.

Or you can develop your own client applications with Oracle's integrated set

of development tools. Including a powerful 4GL, screen generator, report-writer and menu generator.

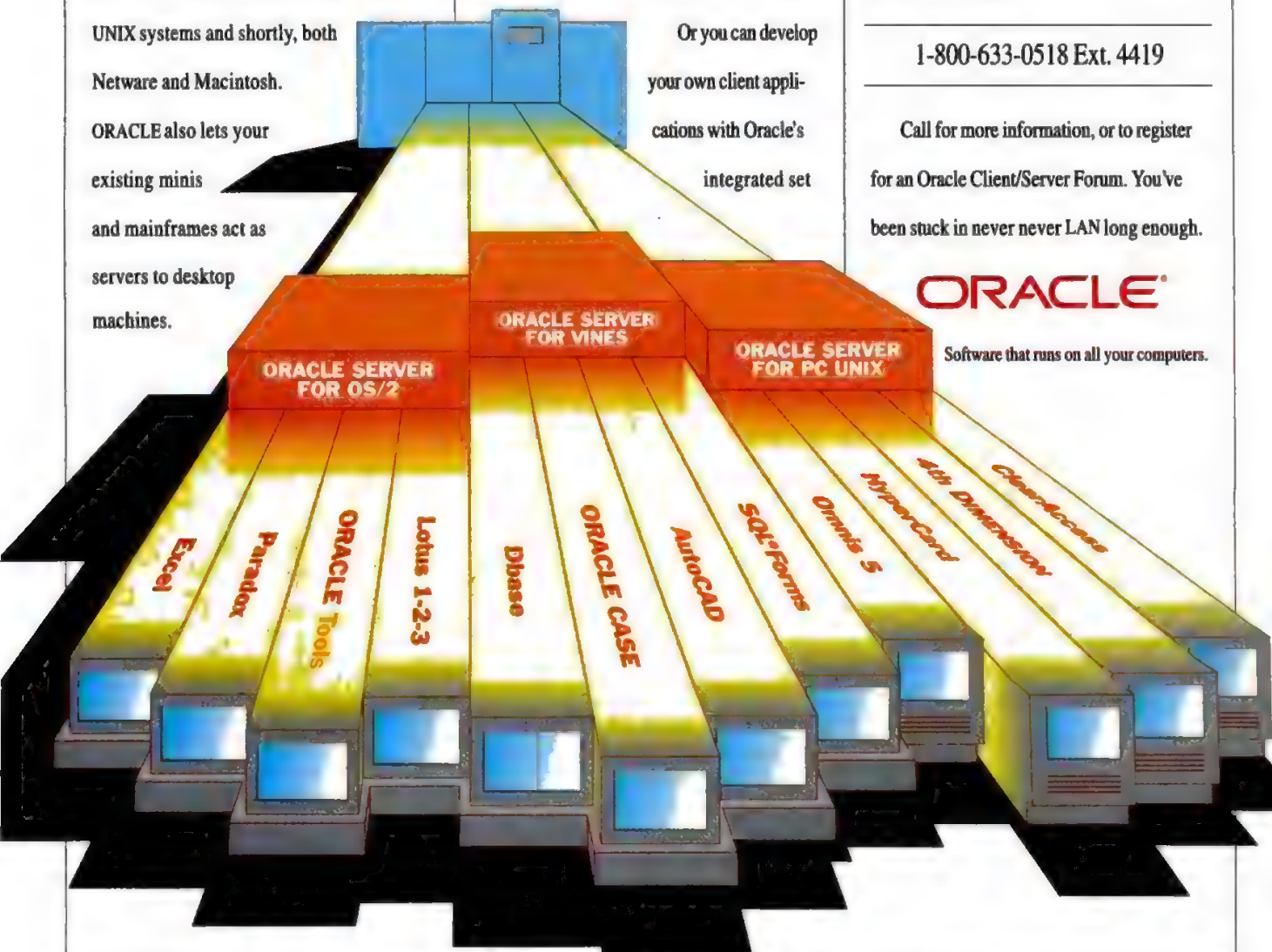
But more than just software products, Oracle provides all the support services to fully transfer client/server technology to you. These services, in combination with ORACLE software products, guarantee your technology investment.

1-800-633-0518 Ext. 4419

Call for more information, or to register for an Oracle Client/Server Forum. You've been stuck in never never LAN long enough.

ORACLE®

Software that runs on all your computers.



William F. Zachmann



Corporate E-mail and Bulletin Boards

Internal corporate communications needs a more-powerful model to tap the resources hidden within our country's business organizations.

Electronic mail seems well on its way to becoming a fundamental application in office systems. Wherever personal computers are connected, whether via traditional mainframe or minicomputer host systems or in more modern distributed resources architectures, "e-mail" in one form or another is likely to be available.

E-mail is already a routine feature (or at least an option) of virtually every local area network system software product. It is a part of almost every traditional system vendor's "grand integration" scheme, and it's an all-but-universal element of every "groupware" product, as well.

The more I use various electronic mail products, however, the more convinced I am that it represents a retrogressive influence on the effective use of information systems—a case of "hitching the horse to the tractor."

That phrase comes from the old joke about the

Maine farmer who, when asked how he liked his new tractor, replied: "Well, it ain't bad. The seat's real comfortable, y'know. But it showah is hahd for the horse t'pull!"

E-mail is another example of using a new technology as if it were simply a one-for-one replacement of the old—instead of taking advantage of its own unique possibilities. In general, this is typical of our use of new technology.

NEEDED: A NEW METAPHOR

With electronic mail, the guiding metaphor is that of paper mail and of the interoffice memorandum in particular: from the formal memo to the casual note slip. Most electronic mail packages are designed with this model in mind.

Each message is explicitly "From:" someone and "To:" someone else with the date, subject, an optional "carbon copy" list, the actual text of the memo, and optional attachments. As with traditional paper memos, more than one person may be included in the "To:" field as well as in the "cc:" field.

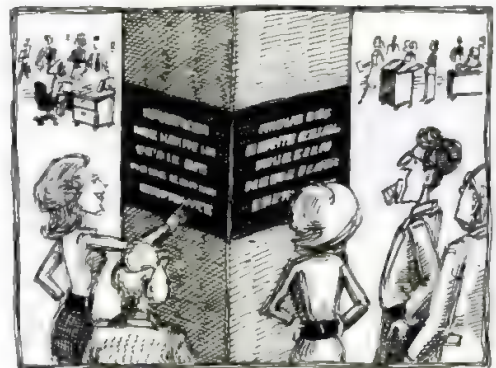
To facilitate that type of distribution, most e-mail software provides functions to create and maintain lists of addressees, as well. Thus one can send multiple copies to "The Executive Committee," "Personnel Task Force," "Research Department," whatever. Distribution lists may be either systemwide or created by individuals for their own use.

In any case, "delivery" of the messages is made by the system only to those explicitly or at least implicitly addressed. The "Mail Waiting, do such and such to retrieve it" message only appears on the workstations of those for whom the mail is intended.

Fine. So what? What's the matter with that? Isn't that a lot better, a lot more efficient than sending paper memos via the mail room? In what way does this amount to "hitching the horse to the tractor?"

Well, there isn't really anything the matter with that. It is better than paper memos in most instances. However, it overlooks a much more interesting possibility. I don't really want to discourage anyone from using electronic mail, but rather to call attention to an additional possibility.

Specifically, I'd like to suggest that the



electronic bulletin board metaphor offers a much more useful and productive model than electronic mail does for internal communications. My contention is that the widespread use of electronic mail obscures the substantial benefits that an internal bulletin board system (BBS) can bring to an organization.

Electronic mail is inherently exclusionary. Its distribution is limited to those individuals to whom it is addressed, bringing with it the

William F. Zachmann

traditional model of the corporate "chain of command" and "proper channels of communication." It confines the information contained in the message to those who are its intended recipients.

A BBS, however, is inherently nonexclusionary. A message on a BBS is posted

publicly, readily available to anyone who wants to read it—not just those who the sender thinks should read it.

INFORMATION FOR TODAY'S OFFICE

One of the most fundamental trends in modern business organizations is that of debureaucratization: the elimination of the elaborate, costly, and inefficient formal structure that often stands in the way of getting work done. Other aspects of this

trend are sometimes termed the "flattening" of the organization or "corporate downsizing."

This trend implies the evolution of organizations: What particular individuals do will be determined more by what they are *able* to do than by their ascribed roles within a rigid corporate bureaucracy. These individuals therefore must better understand the objectives, conditions, and requirements of the organization as a whole.

The BBS model is much better suited to meeting the information needs of such an organization than the electronic mail model. By making information available to all who wish to have it, a BBS offers a powerful vehicle for disseminating information throughout the organization.

To be sure, the electronic mail model is far more congenial to those who occupy their positions as a result of having been put in them rather than as a result of their real capabilities. Those who are incompetent or simply lazy naturally prefer the more controlled environment that e-mail provides. But the benefits of open communications to all who are interested within the corporation are obvious to anyone who is genuinely concerned about creating a high-performance organization. Effectively used by management, an open corporate BBS has the explosive potential to tap erstwhile hidden human resources within the organization.

For nearly two years now I have constantly used the BBS capabilities of PC MagNet and CompuServe. They have amply demonstrated to me the incredible forum for the exchange of information, ideas, and points of view that such a medium provides. Compared to this environment, the various electronic mail systems that I've used over the past decade or so (and continue to use) seem dreadfully restrictive by comparison.

There will always be a need for a restrictive e-mail option for certain internal communications within a company. However, for those organizations that want to gain the maximum advantage from information, that want to take the evolutionary steps that will make them more able to thrive in the more intensively competitive era of the 1990s, that want to maximize the advantage offered by low-cost microprocessor-based distributed resources systems, the potential of using an electronic bulletin board system as their primary model of internal communication ought not to be overlooked. ■



Faxes On Your Laser Printer! **NEW!**

Simple Network Faxing!

"The Best in Show Award [COMDEX] for a simple, elegant and truly useful product."

—John Helliwell,
PC WEEK
11-28-88

Find out how you can benefit from simple, affordable plain-paper fax... PC fax... and network fax. Call today:

1-800-7JETFAX

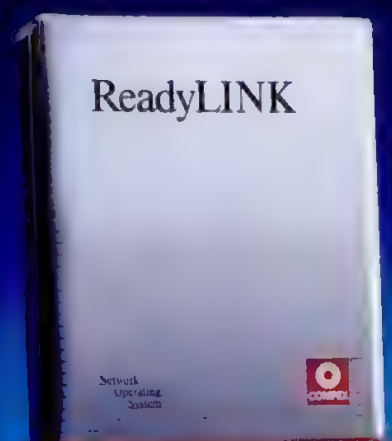
JetFax, Inc.
978 Hamilton Court
Menlo Park, CA 94025
415/324-0600
Fax: 415/326-6003

JetFax lets you get faxes on your laser printer, and provides PC-faxing — even in a network. Benefit from:

- ▶ **Affordable Plain-Paper Fax.** JetFax delivers laser-crisp faxes on your laser print. FAST.
- ▶ **Board-less PC Faxing.** Add JetFaxPC software, and get sophisticated PC faxing *without cumbersome fax boards*. Minimizes PC impact, and receives faxes even when PC & printer are turned off!
- ▶ **Simple Network Faxing.** JetFax empowers networked users — whether in LAN or printer-sharer environments — with PC faxing without complex, dedicated fax servers.
- ▶ **Substantial Cost-Savings.** Save on thermal paper. And copying faxes onto plain paper. And expensive plain-paper fax machines. And dedicated fax servers

JetFax

Build Your Network On A Solid Foundation



ReadyLINK... The First Step for Your PC Network.

Without the right software, your computer network may seem like a house without its foundation. With ReadyLINK from Compex, your network will be versatile, economical and easily expanded to NetWare.

Industry Standard Interface Cards

ReadyLINK doesn't need proprietary interface cards that must be discarded when you want to upgrade to NetWare. ReadyLINK uses most standard interface cards that have a NetWare driver including the complete line of Compex ARCNET and Ethernet controllers.



COMPEX, Inc.

4055 E. La Palma, Unit C, Anaheim, CA 92807
Tel: (714) 630-7302 • Fax: (714) 630-6521
Telex: 401987 COMPEX USA

Low Cost

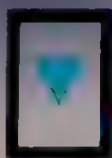
ReadyLINK's astounding \$299 retail price is all the network software cost you need ever incur. There are no software charges as workstations are added. And, with Compex interface hardware retailing as little as \$99 per workstation, your total network will be highly economical.

Software Compatibility

ReadyLINK uses the industry standard NETBIOS interface to insure maximum compatibility with applications programs including Microsoft's Windows 3.0.

So, when it's time to create a computer network, build it on a solid foundation. Anything less might leave you on shaky ground.

Cache



This highly integrated, cache system is the perfect blend of power and flexibility. And, if you crave speed, this is it. But best of all, our 386/25 cache system is available at a price that's competitive with other non-cache systems.

Designed For Speed.

With 128K direct map cache memory, our 386/25 and 386/33 systems are more than fast, they're incredible. We're talking zero wait state memory. And, the 4MB of 32-bit high speed RAM easily supports the new memory hungry, multi-tasking programs. There's also 1MB of 32-bit on-board, video memory that increases the display rate by 50%. It'll take your breath away.



Expandability And Flexibility Galore.

When it comes to standard features, we're unstoppable. Our integrated 16-bit VGA controller supports 1024 x 768 resolution, with 256 vibrant colors. Plus support for interlaced and non-interlaced monitors.

Look At Our Value-Packed 386/33 System.

- | | |
|---|---|
| ☐ 128K cache memory expandable to 256K | ☐ 100MB 17ms IDE hard drive with 64K "look-ahead" cache buffer |
| ☐ 4MB of 32-bit high speed memory (Expandable to 16MB on-board) | ☐ 1.2MB 5.25" & 1.44MB 3.5" floppy drives |
| ☐ High performance 1024 x 768 VGA with 256 colors including 1MB of 32-bit video memory | ☐ 1 parallel and 2 serial ports |
| ☐ 14" Super Hi-Res .28mm dot pitch VGA color monitor with tilt/swivel base | ☐ 101-key enhanced keyboard |
| | ☐ MS DOS 4.01 |
| | ☐ Microsoft Windows 3.0 & Hi-Res mouse |
| | ☐ Free one year on-site service |

386/33 For Only \$2895.00

Check Out Our 386/25 Cache System.

- ☐ 128K cache memory expandable to 256K
- ☐ 4MB of 32-bit high speed memory (Expandable to 16MB on-board)
- ☐ High performance 1024 x 768 VGA with 256 colors including 1MB of 32-bit video memory
- ☐ 14" Super Hi-Res .28mm dot pitch VGA color monitor with tilt/swivel base
- ☐ 100MB 17ms IDE hard drive with 64K "look-ahead" cache buffer
- ☐ 1.2MB 5.25" & 1.44MB 3.5" floppy drives
- ☐ 1 parallel and 2 serial ports
- ☐ 101-key enhanced keyboard
- ☐ Microsoft Windows 3.0
- ☐ MS DOS 4.01
- ☐ Hi-Resolution mouse
- ☐ Free one year on-site service

\$2595

Up to 16MB of RAM on board, using the new industry standard 32-bit memory modules, leaves all six expansion slots available. An integrated floppy controller and hard disk interface support up to three floppy drives and two hard drives. And, our small footprint chassis includes a 100MB IDE hard drive, both 5.25" and 3.5" floppy drives, and 1 parallel and 2 serial ports.

Value You Can Believe In.

Using all-in-one technology, surface mount components and VLSI chips, we're able to reduce component count, minimize board space and diminish noise. Product reliability is simply superior.

Our systems are complete and

Conscious.



800/662-6111



ready to use right from the carton. They come loaded, tested, burned-in, and ready to go. We even preload DOS 4.01 and Microsoft Windows 3.0 and include a high resolution serial mouse as well.

All Standard products are fully protected, beginning with our 30 day money back guarantee. No questions asked. You're also covered by our complete one year

parts and labor warranty, lifetime toll-free customer service hotline, express parts replacement and our free one year, on-site service bonus in qualified areas.

So, if you're cost conscious as well as cache conscious, give us a call. Right now. We'll raise your level of awareness. It's just the Standard thing.

STANDARD

C O M P U T E R

12803 Schabarum Avenue, Irwindale, CA 91706

phone: 818/337-7711 FAX 818/337-2626

CIRCLE 163 ON READER SERVICE CARD

Cash



If you're looking for outstanding value, this is it. Our 386/SX offers the perfect blend of price and performance. And, with our high performance VGA, highly integrated system board and zero wait state memory, this system is not only affordable, it's fast.

Performance You Can Bank On.

Here's the ideal system for business or serious enthusiasts. With 2MB of high

speed RAM memory, our powerful 386/SX systems can easily handle the latest multi-tasking 386 software.

Look At Our Value Packed 386/SX-20 System.

- | | |
|---|--|
| ☐ 2MB of high speed memory (Expandable to 8MB on-board) | ☐ 1.2MB 5.25" & 1.44MB 3.5" floppy drives |
| ☐ High performance 1024 x 768 VGA with 256 colors including 1MB of 32-bit video memory | ☐ 1 parallel and 2 serial ports |
| ☐ 14" Super Hi-Res .28mm dot pitch VGA color monitor with tilt/swivel base | ☐ 101-key enhanced keyboard |
| ☐ 40MB IDE hard disk drive | ☐ MS DOS 4.01 |
| | ☐ Microsoft Windows 3.0 |
| | ☐ Hi-Resolution mouse |
| | ☐ Free one year on-site service |

386/SX-20 For Only \$1895.00

Shown with optional tape drive. 386 is a trademark of Intel Corporation.

Conscious.

Check Our Affordable 386SX-16 System.

- ☐ 2MB of high speed memory (Expandable to 8MB on-board)
- ☐ High performance 1024 x 768 VGA with 256 colors including 1MB of 32-bit video memory
- ☐ 14" Super Hi-Res .28mm dot pitch VGA color monitor with tilt/swivel base
- ☐ 40MB IDE hard disk drive
- ☐ 1.2MB 5.25" & 1.44MB 3.5" floppy drives
- ☐ 1 parallel and 2 serial ports
- ☐ 101-key enhanced keyboard
- ☐ MS DOS 4.01
- ☐ Microsoft Windows 3.0
- ☐ Hi-Resolution mouse
- ☐ Free one year on-site service

\$1795

Standard features include a .28mm dot pitch, 14" 1024 x 768 Super VGA color monitor with tilt and swivel base for comfortable easy viewing.

And, our integrated video controller supports both 256 VGA color and 16 gray scale monochrome. There's also 1MB of 32-bit on-board video memory which increases display rate by 50%.

Expandability And Flexibility To Spare.

Our state-of-the-art technology not only improves reliability, it also decreases noise, saves board space, and dramatically reduces cost. 2MB of zero wait state on-board memory is expandable to 8MB. And, four open full size 16-bit expansion slots offer ample

room for add-on cards. For maximum flexibility, the video controller supports both interlaced and non-interlaced monitors. And, consider this, our 386/SX systems come standard with a 40MB IDE hard drive, a 3.5" 1.44MB floppy and a 5.25" 1.2MB floppy. With

800/662-6111



5 drive bays, there's ample space for an additional hard drive, as well as a tape backup system.

Quality That's Priceless.

Our R&D engineers used the latest technology to produce a system that performs better, has high reliability, a small footprint, superb expandability and an incredible cost/performance ratio.

All systems carry a 30 day, no questions asked, full refund. Plus one year parts and labor warranty. On-site service in qualified areas is included at no extra charge. And, of course, our customer service hotline is toll-free as long as you own your system.

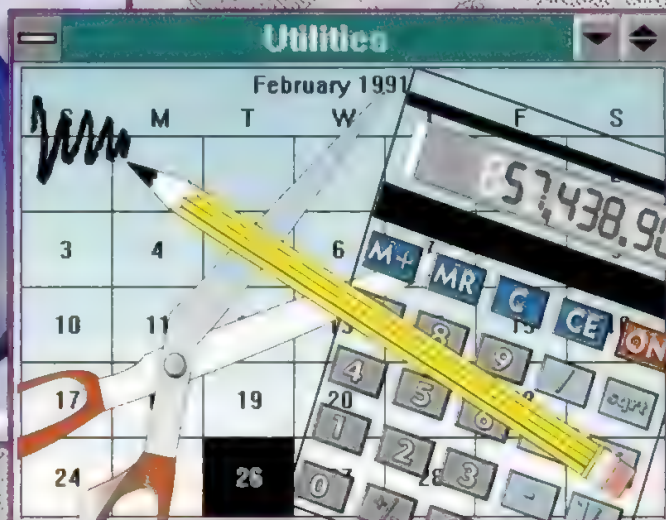
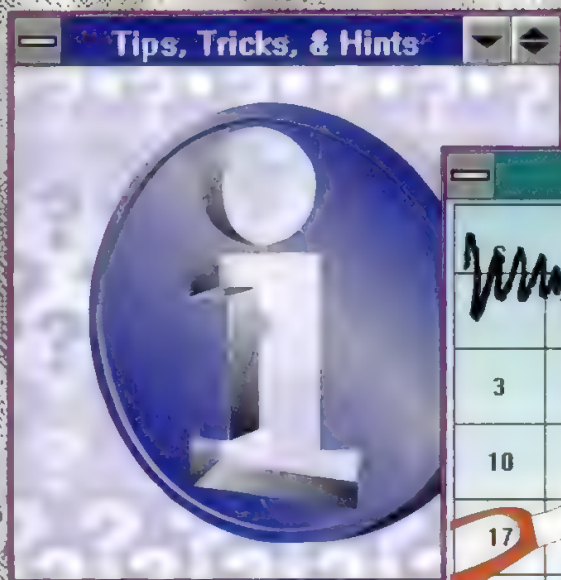
And, to show you how cash conscious we really are, just pick up the phone. We'll pay for the call. It's just the Standard thing.

STANDARD

C O M P U T E R

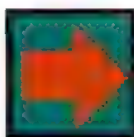
12803 Schabarum Avenue, Irwindale, CA 91706
phone: 818/337-7711 FAX 818/337-2626

CIRCLE 163 ON READER SERVICE CARD



Making The Most of Windows 3.0

by Edward Mendelson



With the advent of *Microsoft Windows 3.0*, everything has changed.

For the first time, users of DOS computers have a graphical user interface flexible and powerful enough to support applications of every kind and of every level of complexity and ambition. The first two versions of *Windows* were suitable mostly for graphics applications and for rare programs like *Microsoft Excel*, which seemed more significant for the glimpse they gave of *Windows*' potential future than they were for themselves. The third version of *Windows* is suitable for almost anything.

Over a million users rushed to take advantage of *Windows 3.0* in the months after its release, and every major software vendor that doesn't already have a *Windows*-based product on the market is hurrying to fill the gap. Microsoft's public-

relations blitz for *Windows* is only partly responsible for this stunning effect on the PC market. The real reason for *Windows*' meteoric success is the confluence of three major factors.

First, an enormous range of *Windows* applications is available now. *Windows* users don't have to wait years for the kinds of applications promised, but not yet delivered, for OS/2.

Second, unlike the Macintosh, with its relatively small installed base and notoriously expensive hardware, *Windows* runs on tens of millions of DOS-based machines. In fact, *Windows* can run on virtually any DOS-based machine with a suitable graphics adapter and monitor. Adequate performance calls for added memory and a speedy processor, but *Windows 3.0* made its appearance at an ideal historical moment when RAM is plentiful and cheap, and fast 386SX and 386-based machines are cheaper than ever.

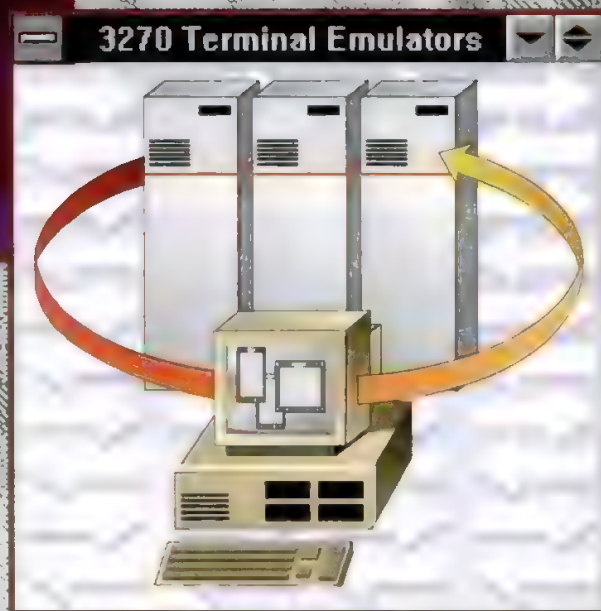
Third, *Windows 3.0* is able to push any PC to its limits in ways that few other programs can. It exploits the powers of a 386 or 486 machine (with at least 2MB of RAM) by letting you multitask DOS sessions while you also run multiple *Windows* applications. Even on a 286 machine, *Windows* lets you multitask *Windows* applications and access up to 16MB of RAM. Although *Windows*' speed and abilities are constrained by an 8088-class computer, even those machines let *Windows 3.0* use expanded memory and multitask all but a few especially demanding applications.

ADJUSTMENTS AND ENHANCEMENTS

None of this means that *Windows* is perfect when you take it out of the box. For all its highly touted ease of use, *Windows* needs careful adjustments and enhancements before it can live up to its full potential. And as most users of *Windows*



In this special four-part report, *PC Magazine* presents user tips, utility reviews, hardware hints, and connectivity options that will help you take *Microsoft Windows 3.0* to the limit.



have discovered, *Windows*' major advantages are all paralleled by significant disadvantages.

Although you can find dozens of powerful *Windows* applications, the limited utilities and accessories that come with *Windows* itself don't help you use those applications as easily or efficiently as you should be able to. *Windows*' file management, a crucial example, is notoriously inadequate, and its desktop too easily collapses into clutter and confusion.

Even though *Windows* runs on virtually any DOS-based computer, hardware that's adequate for DOS applications tends to be inadequate for the more intense demands of *Windows*. For best results with *Windows* on any class of computer, you may need to upgrade your graphics card or monitor, or both.

Windows is potentially capable of pushing all classes of computers to their limits, but it needs careful tweaking and

customization before it brings out the best in any machine.

This issue of *PC Magazine* is designed to help you cope with all these difficulties. The first part of our four-part story is a collection of technical tips from *PC Magazine*'s *Windows* experts. Our suggestions range from simple aesthetic enhancements to the *Windows* screen to technical adjustments that can make *Windows* run in systems that otherwise run it inadequately or not at all. With the help of these hints you can take control of the *Windows* desktop, fine-tune *Windows*' use of RAM and disks, add shortcuts, increase speed, and make better use of the DOS sessions that you run under *Windows*.

The second part covers utilities that supplement or replace the utilities that come with *Windows*. These include file managers, program launchers, text editors, screen and mouse enhancers, macro recorders, utilities for data interchange,

icon editors, and other accessories.

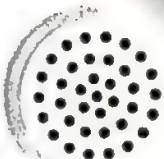
The third part of the story is a report by PC Labs about video performance under *Windows* and how to achieve the best possible results. PC Labs' tests of a dozen graphics adapters demonstrate performance trends and trade-offs.

The final part of the story discusses 3270-to-PC connections that let you look into your mainframe through the colorful lens of *Windows*.

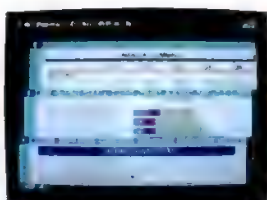
Windows isn't the last word in graphical computing on a PC. Hewlett-Packard's *New Wave*, which runs under *Windows*, makes possible object-oriented computing that should have been provided in *Windows* itself. And *Windows*' architecture doesn't equal the advanced memory-management possible under OS/2. But with the help of this issue of *PC Magazine*, you can make your own personal *Windows* environment far better than the one you took out of the box.



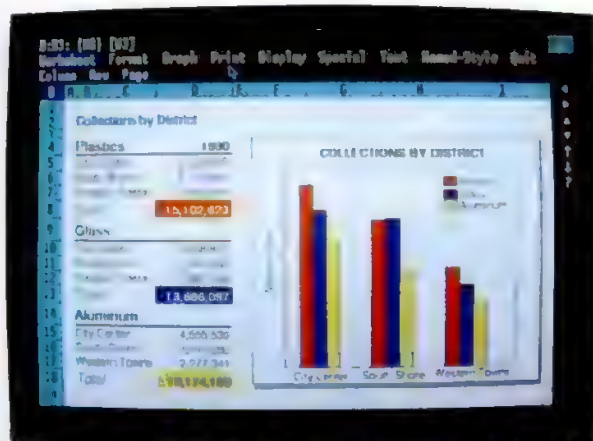
1-2-3 works with either DOS or Windows 3.0. You don't have to change the way you work to work with Release 3.1



Enter data with a keyboard; manipulate it with a mouse. Release 3.1 lets you work with either, or both.



Our unique 3D design is ideal for organizing data and creating multi-page reports.



A graphical WYSIWYG (what-you-see-is-what-you-get) environment shows you exactly what your output will look like. It's easier to work with, and there's no guesswork.

Lotus is the only software company you can call for support 24 hours a day, 7 days a week.

MATERIAL COLLECTION



Quarter	1989	1990
Q1	2,415,407	6,896,816
Q2	1,957,987	5,573,028
Q3	1,331,601	3,760,685
Q4	2,714,454	7,241,481
Total	8,419,449	23,471,910

You can add words, freehand drawing and symbols to make your graphs more persuasive.

Eight combinations of typefaces let you create anything from 2 1/2" tall headlines to tiny footnotes.

Align titles or text—left, right or center—with one simple command.

Only Release 3.1 lets you automatically wrap text around a graph.

WasteCycle Waste Corporation

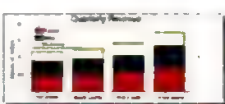
Last year was a good year for the company. WasteCycle was profitable and came very close to achieving its goal in a very uncertain economic and recycling climate.

Revenue by Product

Material collections increased over the year. Plastics continue to bring in the most revenue and profit for the company. Prices for aluminum are still very high and waste area continuing to collect more glass. Materials for the new materials are still in this industry.

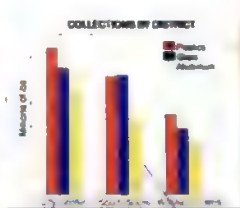
Product	Q1	Q2	Q3	Q4	Total
Plastics	1,180,785	1,180,024	2,374,357	2,838,989	6,584,155
Glass	1,700,304	1,692,135	1,886,430	2,800,994	8,079,863
Aluminum	1,148,884	1,182,022	1,489,421	1,821,793	5,642,120
Total	4,029,973	4,054,181	5,750,208	7,461,776	21,296,138

The graph at the right details our revenue by waste material for the four quarters of 1990. The revenue increases show that companies are building more recycling programs beyond just collecting plastics. Revenue from aluminum and glass have increased as their programs have gained volume. But with all these gains, prices are still very low. We need to look for ways to expand our markets and increase the use of recycled materials.



Collections by District

District	Plastics	Glass	Aluminum
City Center	1,102,073	1,398,087	4,555,536
South Shore	1,102,073	1,398,087	4,555,536
Western District	1,102,073	1,398,087	4,555,536
Total	3,306,219	4,194,261	13,666,608



Mix bold, italics, underlines, colors and typefaces to create over 100 text-style combinations—more than any other spreadsheet.

You can choose from over 200 graph style combinations—even display more than one graph per page.

Since 1983, 7 out of 10 spreadsheet buyers have chosen 1-2-3.* Now we're going after the other 3.

Over 10 million business people are more productive and more insightful because of Lotus 1-2-3.

Now Lotus introduces 1-2-3 Release 3.1.

And if you're currently using 1-2-3, you'll find it offers the features you've been wishing for. Like the ability to see, on screen, exactly what your printed output will look like. Our unique 3D approach to organizing and consolidating spreadsheet data. And the most profes-

sional and persuasive printed reports you've ever created on your computer.

Or if you're one of the holdouts not using 1-2-3, you'll find it offers an interactive, graphical environment. Plus it works with Windows 3.0. And supports both a keyboard and a mouse.

LOTUS 1-2-3 3.1



We've prepared a free demo disk to show you what 1-2-3 can do for you.

First time buyers should visit their local Lotus Reseller. Or to request a Release 3.1 Auto Demo, call 1-800-TRADEUP, ext.321.

And see why 7 out of 10 spreadsheet buyers chose 1-2-3. And the other 3 may not be far behind.

Introducing Lotus 1-2-3 3.1

Tips, Tricks, & Hints



For Windows 3.0

by Don Willmott

Optimize your *Windows* setup with this wide-ranging collection of 35 hints for enhancing *Windows* performance.

Microsoft Windows 3.0 gives you a great deal of control and power over your computing, but the cost of that power is complexity. Using *Windows* is one thing; using it optimally is quite another. We've gathered advice from several *Windows* experts, culled from their personal experiences and from the countless hours they've spent reading *Windows* threads on electronic bulletin boards like PC MagNet.

These 35 hints take you on a tour of *Windows* and your system. They are divided into the following sections:

- Customizing your desktop to your best advantage.
- Fine-tuning your memory setup.
- Fine-tuning your hard disk.
- Improving overall performance.
- Running *Windows* applications successfully.
- Setting up successful DOS sessions.
- Avoiding *Windows* trouble.

FINE-TUNING YOUR DESKTOP

CREATE PROGRAM GROUPS THAT WORK FOR YOU

Microsoft provides a nice start toward a good daily working environment by dividing the *Windows* utilities and applications between the Main program group and the Accessories program group, but you shouldn't be timid about creating your own.

The concept of the Program Manager is to let you group applications logically and in a way that suits you best. By using the File New command you can instantly create new groups that reflect your work habits.

Let's say you start a new project. You'll be using most of your applications but you'll be preparing new spreadsheets and documents. The first step is to create a Program Group (using the Program Manager's File New command). Next, you'll want to fill it with new icons; don't hesitate to install multiple copies of icons that you already use for your spreadsheet or word processor. The installation of an icon doesn't use much memory—all *Windows* icons share the basic program information and simply add a few bytes to the .GRP file. If you tend to work on the same three spreadsheets repeatedly, it makes perfect sense to have a Program Item icon for each one that loads *Excel* or a particular spreadsheet. You can label each icon with a descriptive name of the spreadsheet.

When your icons are out of date, delete them or edit their properties (from the File menu) so they'll have new names and load different files. If you want to redistribute icons among your program groups, you can drag icons from one group to another.

A good guideline is to avoid filling a



Program Group with more icons than will fit in a window at once. The goal is to make your valuable files easier to reach and to get the rarely used icons—like Control Panel and PIF Editor—out of your way. If you only expect to use a small subset of the supplied utilities on a day-to-day basis, you can create a Program Group with a name like Environment, and move the utilities you want into it. Then you can leave the remaining utilities in the original Main Program Group.

One simple way to make sure you leave seldom-used utilities out of your way is to turn off the "Save Settings" option in Program Manager so you don't start out with the messy desktop you left last night. You should turn on "Save Settings" only when you want to change the arrangement of open Program Groups.—Gus Venditto

TOWARD A TIDIER DESKTOP: OPTIONS TO EXERCISE

Windows's great ability to open lots of files at once is also its greatest trap. How are you going to find anything with seventeen layers of windows to sort through?

Program Manager has a couple of choices in its Options menu that look complicated at first glance but are really handy housekeeping tools for tidying your desktop with a keystroke.

Auto Arrange will prevent your icons from obscuring other icons on-screen. It

keeps the Program Item icons in neat rows and columns. Even if you move icons around in a window, they will come up in neat rows the next time you open the Program Group.

Minimize on Use will reduce the Program Manager to an icon whenever you run an application. This keeps the Program Manager screen and Program Group windows located inside from distracting you while you work. You'll have to restore the Program Manager to its normal size when you quit the application, but if you tend to keep lots of different documents open, you're better off keeping your desktop uncluttered and making the extra effort to reopen Program Manager when you need it.

Both options are on-or-off choices; they operate only when you click on the menu listing and leave a check mark next to them.—Gus Venditto

FIX THOSE OBSCURE ICON LABELS

Smart as it is, *Windows* can sometimes act very stupidly. It invites you to create Program Item icons with individual names beneath them, and offers a long dialog text box so you can be as descriptive and detailed as possible. And you fall for the invitation by accurately describing your program group using three or four words.

But when you take a look at your handiwork, *Windows* displays garbage. You discover that any Program Group icon that has a description longer than 15 characters will overlap the description of neighboring icons that also have long names. Even Microsoft's own default names for *Windows* Applications and non-*Windows* Applications overlap if the icons are next to each other.

The fix is buried inside the Control Panel's Desktop module. The setting for Icon Spacing needs to be increased if you want your icons to have enough room to display long labels. You can try setting it at 110 or even higher if you want to use really descriptive labels.

However, specifying a high setting for Icon Spacing makes Program Manager use up too much real estate for each icon, and many of your icons will end up hidden in the border. If you set Icon Spacing too high, you'll end up with only one icon on a line.

While you're fiddling with the Desktop settings, you may also want to increase your border width. Stretching a window with quick click-and-drag moves

OUR CONTRIBUTORS

Edward Mendelson is a contributing editor of *PC Magazine*.

Paul Murphy is the section leader of the Microsoft *Windows* forum on *PC MagNet*.

Barry Simon is a contributing editor of *PC Magazine*.

Gus Venditto is an executive editor of *PC Magazine* and author of *The PC Magazine Guide to Windows*, to be published by Ziff-Davis Press in April.

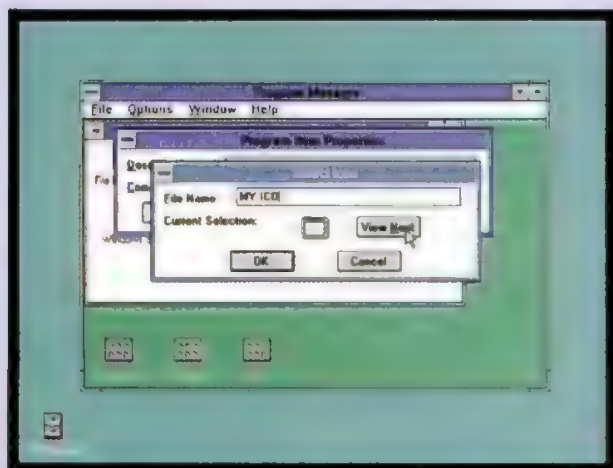
Don Willmott is an associate editor of *PC Magazine*.

Ideas for some of the hints included in this issue were provided by Brian Moura, a sysop on CompuServe's MSWIN forum.

to find the low default setting makes it too hard to grab hold of a border. I keep mine at 4. A higher setting gives you very thick borders that aren't any easier to maneuver.—*Gus Venditto*

USE CUSTOM ICONS

Suppose you get a custom icon from a bulletin board or a friend, or you'd prefer



To install a custom icon, type its name into the Select Icon dialog box located above the Program Item Properties dialog box.

to use the icon from one program to represent another. How do you change the icon? For a program accessed via the Program Manager, it's easy.

Set up the program in a Program Manager window by using File New and typing the program name in or by dragging the program from a File Manager window to a Program Manager window. Now select the program by clicking ONCE on the icon and choosing Properties from the File menu. Click on the Change Icons button, and a dialog box appears with the program's filename selected.

Do not succumb to the temptation to pick "Next Icon." That will only search through the program file itself for additional icons. Instead, type in the full name of the file that has the icon you want to use, normally a file with a suffix of .EXE (for an icon for another application) or .ICO (for a separate icon file). Now pick "Next Icon" and click on OK repeatedly until the dialog box is closed.

While Program Manager will let you select the application by clicking on the new icon, when you run the program and then minimize it, the desktop insists on displaying the icon from the original .EXE program, or if you're running a DOS program, it insists on displaying the standard DOS icon.—*Barry Simon*



CREATE YOUR OWN WALLPAPER

If you walk past a computer that is being used by a Windows expert, you will probably see a fancy wallpaper design behind the windowed applications. That's customized wallpaper. If you buy a new PC that comes with Windows software al-

quirement for the original image is that you have a Windows application that will display it.

Wallpaper is merely a graphic stored in Windows' new .BMP (bit-mapped) format. Since Windows comes with the Paintbrush accessory, which can save images as .BMP files, and since the Clipboard can act as intermediary between Windows applications and Paintbrush, the only limiting factor to the kind of image you use is your ability to display the image under Windows.

If the image you want to use as wallpaper is visible in a Windows application or in a DOS application that does not run in text mode, you copy the image into the Clipboard by running the program. If the application is running full-screen, you copy it to Clipboard by pressing the PrtSc key; if it's running in a window, you capture it with an Alt-PrtSc key combination.

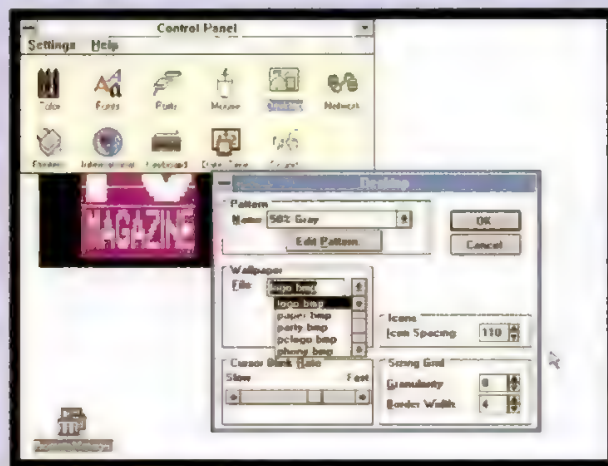
Then, run Paintbrush, and in a new and empty file use the Edit-Paste command to move the image from Clipboard into the Paintbrush work area. You can use any of Paintbrush's editing tools to cut out parts of the screen you don't want, or to enhance the image. Of course, you can use Paintbrush to create your own images from scratch.

Now, all you need to do with your Paintbrush images is to save them in .BMP format in your main Windows directory. Then, you can edit your WIN.INI file's Wallpaper= line to include the name of your .BMP file, or run the Desktop section of the Control Panel. If your .BMP file is in the main directory, it will now be one of the wallpaper options that you can select for your display.

—*Gus Venditto*

ready installed, chances are you've got the manufacturer's logo staring you in the face every day. That's customized wallpaper, too.

The first step to your own decorating job is finding an image that you think you'll want to look at every day. Most wallpaper screens start out as a captured image—a display that is saved to a file with any one of the screen-capture programs that are available commercially or on PC MagNet and other electronic bulletin board services. You can also use images that have been scanned. The only re-



The Control Panel's Desktop module gives you the option of installing any .BMP file in the directory as your wallpaper. This is also the window where you can change the spacing on icons and the width of a border.

FINE-TUNING MEMORY

MAKE SURE YOU HAVE ENOUGH MEMORY (AND THE RIGHT MACHINE)

When *PC Magazine* evaluated *Windows 3.0* in depth ("Windows 3.0 Under the Spotlight," September 11, 1990), we made specific recommendations about the type of system and configuration you should have in order to run *Windows* optimally. They bear repeating.

Though Microsoft says the minimum requirements for *Windows* are a 286 with 1MB RAM for Standard mode or a 386 with 2MB RAM for 386-enhanced mode, you'll probably find these configurations inadequate if you use large *Windows* applications like *PageMaker*.

Realistically, you should have at least a 20-MHz 386SX-based or 20-MHz 386-based machine with 2MB RAM. If you plan to use 386-enhanced mode, having 4MB RAM or more is a good idea.

Take a look at the sizes of some of the *Windows* files and you'll quickly realize that your *Windows* machine should have at least a 40MB hard disk. A 16-bit VGA adapter is almost a necessity as well.

—Don Willmott

REMOVE FONTS TO SAVE MEMORY, BUT ONLY WHEN YOU'RE DESPERATE

A large stash of fonts is generally one of the privileges of the *Windows* user. People run *Windows* to get more fonts than they get from DOS, and they don't like to follow the advice given in the manual that says that you should delete seldom-used

fonts in order to save memory.

You really shouldn't trim back on fonts to save memory. Most fonts take up only about 2K RAM; to make any kind of significant saving you'd have to eliminate all but the Helvetica fonts needed to satisfy *Windows*'s own menu-display needs.

However, if you are in dire memory straits, you may want to trim back on fonts, knowing that you can always restore them when memory isn't as scarce.

To remove fonts, use the Fonts module in the Control Panel; they're easy to restore as long as you know *Windows* keeps them in the \SYSTEM subdirectory underneath the main *Windows* directory.

—Gus Venditto

SET ASIDE SOME RAM AS A DISK CACHE

The most effective way to speed up *Windows*' operations is to dedicate some of your RAM to a disk cache. A cache sets aside a chunk of RAM in which to store copies of the most recently read disk data. The reason for this is that you're likely to reuse any data you've already used once, and reading it from RAM is much faster than reading it from your disk.

When you installed *Windows* on your system, you automatically installed a cache called SMART-DRV.SYS in your *Windows* directory, and there's no reason not to use it if you don't have other third-party caching software. (WARNING: Microsoft strongly urges that users of nonDOS partitioning schemes like *Disk Manager* should not run SMARTDRV.) SMARTDRV is a device driver and a typical line that loads it from your

CONFIG.SYS file would read as follows:

```
device=c:\windows\smartdrv.sys  
1,024 256
```

The first parameter on the line, in this case 1,024, is the amount of RAM (in kilobytes) set aside for SMARTDRV. SMARTDRV works in concert with *Windows*, letting the *Windows* environment itself borrow memory from SMARTDRV as needed. The second number specifies the amount of memory that *Windows* cannot borrow from the SMARTDRV. In this case, *Windows* can borrow up to 768K and must leave 256K for caching.

With 2MB to 4MB RAM in your system, this is probably the best setting to use. But if you have more than 4MB RAM, you may want to consider some of the third-party caches, which are often more efficient but whose RAM cannot be lent to *Windows*. Multisoft's *Super PC-Kwik* and the shareware *Hyperdisk* are popular among *Windows* power users.

—Barry Simon

CONSIDER TURNING OFF THE EMS PAGE FRAME

If you run *Windows* in 386-enhanced mode and never intend to use EMS memory in DOS sessions, add the following line to the [386Enh] section of your SYSTEM.INI file:

```
ReservePageFrame=false
```

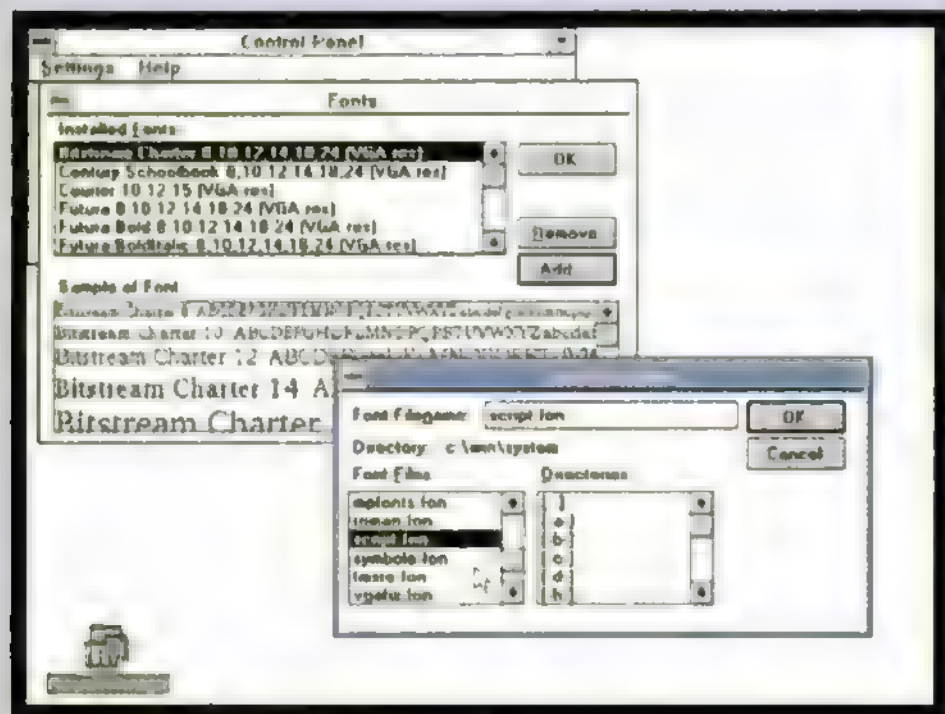
This will turn off EMS support for DOS sessions opened under *Windows*, but also frees up additional low memory for *Windows* to use as a buffer during file operations when it has to shift to real mode.

—Barry Simon

ENLARGE YOUR DOS ENVIRONMENT FOR DOS SESSIONS

Suppose you want to run a DOS batch file from *Windows* that uses the SET command to establish some environmental variables before the batch files load a DOS program. You've probably found that when you try, you get "out of environment space" messages even if you used the well-known method of arranging a large environment with the SHELL command in your CONFIG.SYS file.

Windows runs a shell of DOS, and such shells collapse the environment down to fewer than 16 bytes of free environment.



The only reason to remove fonts is to free up more RAM. You can always restore the fonts, as long as you know the name of the directory where they've been stored.

The solution is simple: use the /e parameter for COMMAND.COM. Suppose the batch file that you want to run is C:\BAT\DOSSSESS.BAT and you need a 512-byte environment. Instead of listing the program name in Program Manager as "dossess.bat," name it

```
command.com /e:512 /c
C:\bat\dossess.bat
```

—Barry Simon

FINE-TUNING YOUR DISK

MAXIMIZE YOUR HARD DISK SPACE

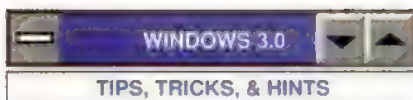
One of the drawbacks of *Windows 3.0* is the large amount of disk space used up by the files loaded during the installation procedure.

Although the amount of territory consumed will differ depending on your hardware and networking requirements, Setup will install a standard set of files, some of which may be deleted after the installation is complete. Here is a list of space requirements for different installations:

80286 with no network link	4.4MB
80386 with no network link	6.1MB
Network workstation	195K
Network server	9.4MB
Optional Asymetrix Toolbook	979K

The following files can be deleted if disk space is at a premium:

- *.BMP—Wallpaper files
- SOL.EXE, SOL.HLP—Solitaire game
- REVERSI.EXE, REVERSI.HLP—Reversi game
- MS-DOS.EXE—MS-DOS Executive
- PBRUSH.EXE, PBRUSH.HLP—Paintbrush
- WRITE.EXE, WRITE.HLP—Write
- CALENDAR.EXE, CALENDAR.HLP—Calendar
- CALC.EXE, CALC.HLP—Calculator
- CARDFILE.EXE, CARDFILE.HLP—Cardfile
- TERMINAL.EXE, TERMINAL.HLP—Terminal
- RECORDER.EXE, RECORDER.HLP, RECORDER.DLL—Recorder
- CLOCK.EXE—Clock
- EMM386.SYS—Expanded memory emulator



Deleting these files can save up to 1.3MB (not counting .BMP files) of disk space.

—Paul Murphy

MOVE WINDOWS 3.0 TO A NEW DIRECTORY

As your *Windows* directory swells with new utilities and programs that you acquire from PC MagNet and other sources, you may find yourself wishing that you had installed *Windows* on drive D: instead of drive C:. You have two options for moving the *Windows* program files: reinstall and start over or follow these guidelines to edit the *Windows* files necessary for a manual move.

First, copy all files in your *Windows* 3.0 directory to their new location. (Make sure that you create a /SYSTEM subdirectory and copy all of those files as well.) Using an ASCII text editor, open all *.INI files in the new directory and check the whole file for references to the old path, changing it to the new path. The program group (*.GRP) files contain references to the old directory. Use your ASCII editor to change all references to the new path.

One way to make sure that you duplicate the original directory structure on the new disk is to use the XCOPY command found in DOS 3.2 and later. The syntax to use is

```
xcopy c:\windows d:\windows /s /e
```

The /s parameter copies all subdirectories below the \WINDOWS directory, and the /e parameter duplicates any empty subdirectories in addition to full directories.

One way to change all references to the new path in your .INI and .GRP files is to use *Windows Write*. Be extremely careful when you do this and make sure you have backups of all the original files. Open each file in *Write*, and when you see the message in the dialog confirming that you want to convert the file into *Write* format, tell it not to. If you make a mistake, open the file again without saving the version on-screen. This is extremely important; if you convert the files to *Write* format, *Windows* won't be able to see them.

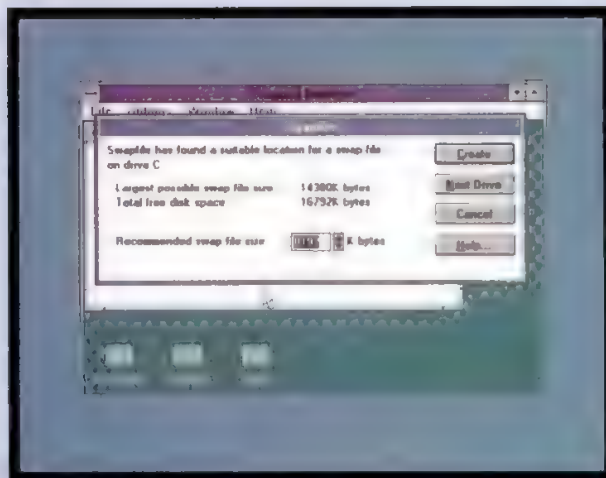
Once you have the file in *Write*, go to the Change dialog box, which you'll find under the Search menu. In the dialog box, type C:\WINDOWS as the string you want to find, and D:\WINDOWS as the string you want to change it to. Then click on Change All, and save the file. Make sure you leave the Text Only dialog box checked.

It's best to retain *Windows* in its old location until the move is made successfully, but you must eliminate the path to it in your AUTOEXEC.BAT file and add the path to the new *Windows* directory. Then you're ready to reboot and start *Windows* from its new location.

—Paul Murphy and Edward Mendelson

USE SWAPFILE IN 386 ENHANCED MODE

If you regularly run *Windows* in 386 enhanced mode, you may wish to set aside a permanent swap file. When *Windows* runs out of normal extended RAM, *Windows* can use special routines built into the 386 chip to swap memory to the hard disk efficiently. This will run faster if you have a ready-made file of contiguous disk space for *Windows* to swap to. The downside of



The SWAPFILE program needs to be run in real mode, although the file it creates is only needed in 386-enhanced mode.

this procedure is that this disk space will not be available for programs or data files.

Before installing a swapfile, be sure to run a disk defragmenter like the *Norton Utilities'* Speed Disk first. Then run *Windows* in real mode (win/r), close all utility applications except the Program Manager, select File Run from the menu, and run SWAPFILE.EXE.

This is the program that sets aside an area of the hard disk for swapping, and it offers you a suggested size for the file that you can accept or modify. Some experimentation suggests that SWAPFILE first finds the largest available unfragmented area of disk space and offers that as the maximum swap file size. It suggests that you use half of this free space or 8MB, whichever is smaller. This default may be too high for some users. If you have only 6MB free, you may want to commit 2MB rather than 3.—Barry Simon

MAKE SCSI HARDWARE WORK WITH WINDOWS

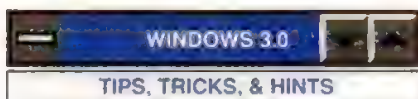
Windows gets down to pretty low levels of hardware manipulation, especially in 386 enhanced mode. This means that SCSI hard disks, which typically use extensions to the standard BIOS, can be problematic to anyone trying to run *Windows*. This is especially true of bus-master SCSI host adapters such as the Adaptec AHA 154x series. However, with proper care and advice from your hardware vendor or Microsoft, you should be able to get your SCSI hardware to work.

You'll probably need special drivers, but you can choose between drivers that come with *Windows* and those supplied by the vendor. For example, with the Adaptec controllers, you have three options for running your system in 386 enhanced mode:

- Use SMARTDRV.SYS with the /B parameter, or
- use the SCSIHI.SYS driver available on Adaptec's BBS at no charge (this takes 64K of conventional RAM), or
- use Adaptec's special ASPI driver (ASW 1410, Version 2.0), which is often shipped with the host adapter or available at an extra charge.

The last solution, which has a driver directly negotiate the use of the bus master with *Windows*, is the best one to use in most situations.

—Barry Simon



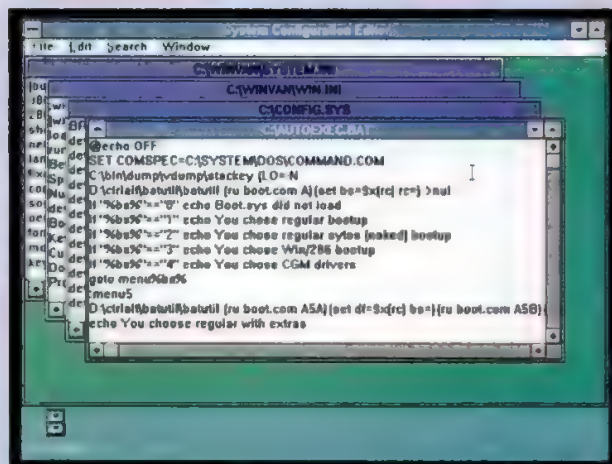
FINE-TUNING PERFORMANCE

INSTALL AND USE SYSEDT

For some reason, Microsoft shipped a little gem with *Windows* but didn't docu-

and ignored utility in the *Windows* 3.0 package. This is probably due to Recorder's seeming inability to run its macros except from its own macro menu. Here is an undocumented method of assigning your Recorder macros to an icon.

Let's assume you have a dot matrix printer and a laser printer installed in *Windows*. You regularly change the active printer by accessing the Control Panel.



SYSEDT, the Systems Configuration Editor, loads your four critical system text files into a useful editor.

ment it or automatically install it into Program Manager. This useful program is called SYSEDT and can be found as SYSEDT.EXE in the System subdirectory of your \Windows directory. Call up File Manager, shift to that directory, and drag this program's icon to your main Program Manager window. This doesn't actually move the file; it makes it easy to call any time you want it.

SYSEDT calls up your four most-basic system files—CONFIG.SYS and AUTOEXEC.BAT from the root directory and WIN.INI and SYSTEM.INI from your *Windows* directory—and displays them in four windows cascaded within the SYSEDT window. The editing power is roughly that of *Notepad* with the extra advantage that SYSEDT lets you search backward and forward.

SYSEDT's only real downside is that it is limited to files no larger than 35K, but unless your WIN.INI grows large from myriad applications, that shouldn't be a problem. Tell your friends about this hidden beauty.—Barry Simon

START RECORDER MACROS FROM ICONS

The *Windows* Recorder (RECORDER.EXE) is undoubtedly the most underused

Why not automate the switching?

Record two macros using Recorder and name them DOT.REC and LASER.REC, assigning each macro a shortcut key combination that opens the Control Panel and makes the respective printers active. Start a new icon for each macro using DOT and LASER in the File Description and RECORDER.EXE on the command line of each. Then you should add the following parameters to the command line:

RECORDER.EXE [-h shortcut key] [filename.rec]

The -h tells Recorder to execute the shortcut key. The shortcut key should be written using the symbols

ALT	%
CTRL	^
SHIFT	+

A key combination of Ctrl-Shift-F8 for LASER.REC would be written

RECORDER.EXE -h ^+F8 LASER.REC

Now by simply double-clicking the DOT or LASER icons you change active printers.—Paul Murphy

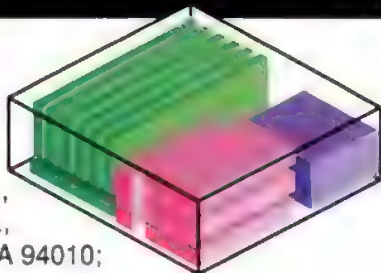
A Winner.

We didn't say it.
PC Magazine did.



FACT FILE

EDITORS' CHOICE



Tangent
386SX/20
Tangent
Computer, Inc.,
303 Beach Rd.,
Burlingame, CA 94010;
(800)223-6677,
(415) 342-9388.

List Price: With 1MB RAM, 1.2MB 5.25-inch or 1.44MB 3.5-inch floppy disk drive, one parallel and two serial ports, VGA monitor, \$1,644; with 2MB RAM, 60MB hard disk, DOS 4.01, \$2,278; with 105MB hard disk, \$2,384.

In Short: An excellent contender with above-average electronics and hard-working peripherals, the Tangent 386SX/20 adds an FCC Class B certification to the pile to make it an extremely attractive computer for either home or office.

"The 20 MHz 80386SX is the new entry-level business system of choice, starting right now."

PC Magazine

Best choice of the best choices.

Here's how PC Magazine summed up the Tangent 386TMSX/20 (Tangent's Model 320s):

"The Tangent 386SX packs outstanding video, expandability to 8 MB, and plenty of free slots into a nicely reduced-size case. The price is right too. This PC offers a 105 MB hard disk and Orchid's ProDesigner II Super VGA card for a mere \$2295. Add in clear documentation and on-site service (with Tangent's one-year warranty) and you have a solid winner."

"The Tangent 386SX/20 is the best of the show; it garnered top scores in all of our video tests."

A system with a future. The Tangent 386SX/20 runs all of yesterday's programs. All of today's. And most important, tomorrow's. Because it implements the full Intel 80386 feature set.



Standard Configuration:

- Intel 20 MHz 80386SX CPU **\$2295**
- 2 MB of Memory (to 8 MB)
- 105MB 17ms Quantum Hard Disk
- Orchid ProDesigner IIe SuperVGA Card
- 14" SuperVGA Color Monitor
- Small Footprint Case w/200W Power Supply
- 5.25" or 3.5" High Density Floppy Drive
- Coprocessor Socket
- One Parallel, Two Serial, One Game Port
- 101-key Enhanced Keytronics Keyboard
- One-year Warranty with On-site Service

PC
MAGAZINE

EDITORS'
CHOICE

November 27, 1990
Tangent 320S

Why buy their computer, when we'll build yours?

High performance. Low price, Tangent offers you a complete line of high performance systems: 20 MHz 80386, 25 and 33 MHz 80386SD, and award winning 25 and 33 MHz 80486. All, at what some people think is the best price-to-performance ratio in the business.

Built your way. Dealing with Tangent is like owning your own computer factory. Tell us exactly how you want your system configured, we'll build it, test it, and ship it. Your way. And even though it's your configuration, it carries our one-year warranty.

PC Magazine's windup: "Add an FCC Class B rating and a one-year warranty on parts and labor that includes on-site service into the bargain, and you begin to suspect that the Tangent 386SX/20 is a winner. Consider the price/performance ratio of the computer and that suspicion starts to look like a certainty."

Bill O'Brien, PC Magazine, 11/27/90

Thanks Bill. We couldn't have said it better.

Order now, Toll Free:

1-800-223-6677



TANGENT
COMPUTER

197 Airport Blvd. Burlingame, CA 94010
Phone: 415/342-9388 FAX: 415/342-9380

CIRCLE 391 ON READER SERVICE CARD

*All pricing subject to change without notice. ©1990 Tangent Computer. Tangent is a registered trademark of Tangent Computer, Inc. 386 is a registered trademark of Intel Corporation. Other product names may be the trademarks or registered trademarks of their respective companies.

MODIFY _DEFAULT.PIF

When you run a DOS program from *Windows*, such as TP.EXE, *Windows* looks for a .PIF file called TP.PIF in the *Windows* directory or in your path. What if it can't find such a .PIF file? In this situation *Windows* 2.0 pops up a box that asks if it should use its built-in defaults. *Windows* 3.0 goes beyond that; not only doesn't it pop up a window, the defaults used can be modified.

When it is installed, *Windows* 3.0 places a file called _DEFAULT.PIF (the underline is part of the name) in the *Windows* directory. If a custom .PIF file cannot be found for a DOS application, then *Windows* uses _DEFAULT.PIF instead.

Because _DEFAULT.PIF is a standard .PIF file, its options can be edited by loading PIFEDIT (which you'll find in the accessories group), and choosing _default from the File Open dialog box.

—Barry Simon

USE COMMAND-LINE PARAMETERS WHEN RUNNING WINDOWS

If you know exactly what file you want to edit when you start *Windows*, enter its name on the command line. If its extension is listed in the Extensions section of WIN.INI where each extension is associated with a specific program, *Windows* will automatically start the program that normally runs that file, and open the file you named. For example, you could enter the following on the DOS command line:

```
win c:\sales\january.xls
```

That sets in motion a process that loads *Excel* and opens JANUARY.XLS. The Program Manager will be reduced to an icon.

If you know which program you want to run first but don't know the name of the file you want to open, you can enter its name on the DOS command line, like this:

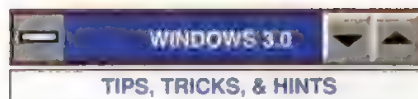
```
win excel
```

And if you want to open a file whose extension isn't listed in the Extensions section, you can enter the name of the program and the file, like this:

```
win write textfile.new
```

Such shortcuts can save you time.

—Edward Mendelson



BRING BACK THE SPEED KEYS FROM WINDOWS 2.X

In *Windows* 2.x, when you want to minimize, maximize, or restore a window you can simply press the keyboard shortcuts Alt-F9, Alt-F10, or Alt-F5 respectively, instead of using the mouse or pressing Alt-Spacebar to go to the Control Menu. In *Windows* 3.0 you have to use the mouse or the Control Menu, presumably because Microsoft wanted to leave the keys used by the old shortcuts free for use by applications.

If none of your applications use Alt-F9, Alt-F10, or Alt-F5 for their own purposes, you can get back the old *Windows* 2.x keys by using the method that is suggested by John McNamee on CompuServe. Start by running Recorder, and open a New macro file. Select Macro Record. Enter "Minimize" in the Record Macro Name box. Choose Alt-F9 as the Shortcut key, and make sure that the Playback options are set to "Same Application," "Fast," and "Enable Shortcut Keys." Now press Start to begin recording the macro.

Press Alt-Spacebar and N (for minimize). Then press Ctrl-Break. Select Save Macro from the dialog box. Now go through a similar procedure to create macros for Maximize and Restore with Alt-F10 and Alt-F5 as the shortcut keys.

Save the macro file as Altkeys.Rec. Edit your WIN.INI file to include Altkeys.Rec on the LOAD= line. When you next start *Windows*, the macros will be activated and you can use the Alt-keys to change the size of your windows as you

did when you used *Windows* 2.x.

If you don't want to enter the macros by hand, you can download John McNamee's version from the Accessories library in the MSWIN forum on CompuServe.—Edward Mendelson

SPEED UP DOS SESSIONS IN 386 ENHANCED MODE

If you are running *Windows* in 386 enhanced mode, you may want to add the following line to the [386Enh] section of your SYSTEM.INI file:

```
FileSysChange=false
```

If you do this, any changes you make to files during a *Windows* DOS session will not automatically be registered in File Manager. You'll need to tell the File Manager explicitly to reread changed directories, but Microsoft says that you'll significantly speed file access in DOS sessions.—Barry Simon

TURN OFF HIGH GRAPHICS PORT MONITORING IN TEXT MODE PIFS

Because they don't know if you will be using graphics memory, any custom PIFs that you make for DOS partitions in 386-enhanced mode have Graphics Port Trapping turned on by default. You'll improve performance in 386 enhanced mode if you turn this option off for text mode applications that never use graphics. Using the PIF Editor, go to the Advanced options and be sure that the High Graphics check box in the "Monitor Ports" section of "Display Options" is not checked.

—Barry Simon



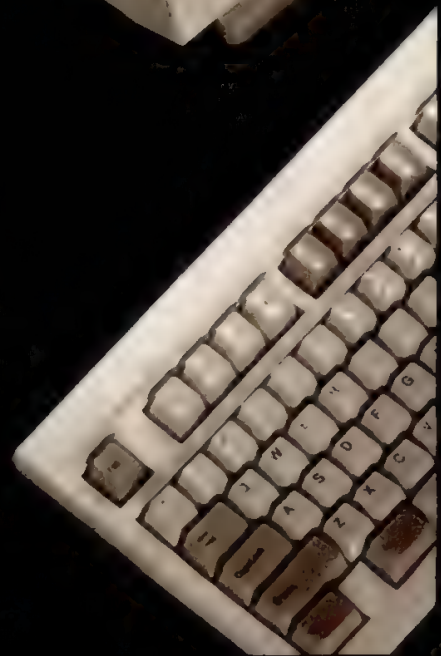
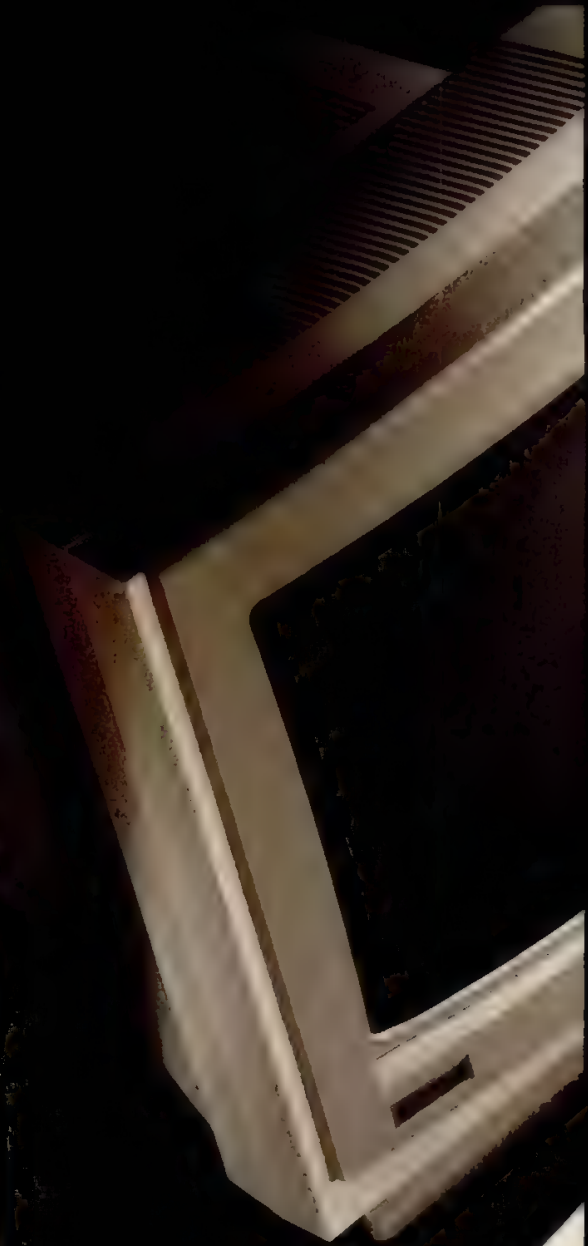
In the 386-enhanced .PIF options, be sure to turn off the High Graphics monitoring pointed out here.



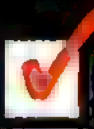
“There is very
little more you
can ask for from
a computer.”

— *PC Magazine*
January 15, 1991

But ask anyway!



How about:

 Editor's Choice  33MHz '386  128K SRAM
Cache  Up to 32MB Motherboard Memory
 Eight Bay Vertical Case  250 Watt TurboCool
Power Supply  Twin Cooling Fans  DOS 4.01
& Windows & Mouse  FCC Class B  24 Hour
a Day Toll Free Sales and Technical Support

**"The combination is as close to
unbeatable as you can get."**

— PC Magazine

Windows and a mouse, plus Microsoft DOS 4.01. All at no additional charge. A rip-roaring Cache, extra Memory and Windows 3.0. What more could there be? From ZEOS, lots more.

ZEOS 24 HOUR A DAY SUPPORT. TOLL FREE.

If you should need assistance, you want your computer company to be there no matter what the hour. That's why ZEOS invented *24 Hour a Day Sales and Technical Support*. We did it for you. And it's the best in the business. As a ZEOS customer, you are supported around the clock, *any time of the day or night*. With ZEOS you can have complete confidence in support, in your system and in the company.

Because at ZEOS, we not only build our own systems, we design them from the ground up too. Unlike most of the others, ZEOS maintains its own chip level Research and Development Labs plus our own board level manufacturing facility. All right here in St. Paul, Minnesota, USA.

You can buy with confidence too because ZEOS is a strong and rapidly growing public company (NASDAQ Symbol: ZEOS). As a matter of fact, according to *INC. Magazine*, ZEOS is America's 19th fastest growing public company! And, our professional

Systems Consultants and expert Technical Support staff serve tens of thousands of customers World Wide, Twenty Four Hours a Day.

Performance. Quality. Price and Support. And all of it backed by the ZEOS Customer Satisfaction Package which includes our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy. You're going to be very satisfied. We don't just say it. *We Guarantee it!*

ORDER YOUR NEW ZEOS '386 TODAY!

As *PC Magazine* recently said "It's difficult to be more eloquent about the ZEOS '386-33 than it already is about itself." They went on to say ZEOS shows "you needn't be among the most expensive to be the best." We couldn't have said it better ourselves.

Why not pick up the phone and give us a call right now. Your own expert Systems Consultant is waiting here now to help you tailor your new ZEOS '386 to your specific needs. Buying your ZEOS '386 is perhaps the best purchase decision you'll ever make! After all, your satisfaction is absolutely *Guaranteed*.

CALL NOW TOLL FREE

800-423-5891

DON'T FORGET THE OPTIONS!

As *PC Magazine* said, ZEOS offers "more options than even the most configuration hungry hound could possibly need." Because every ZEOS system is custom built you may choose from a huge selection of hard drives, video packages and many other options. On-site service is available too. Call 800-423-5891 for details.

ZEOS '386 SYSTEMS— A FEW EXPERT OPINIONS:

PC Magazine, "Out of 104 machines from 58 companies... For Overall Excellence we selected ZEOS International..."

InfoWorld, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent. Value: Excellent."

Government Computer News, "Arguably the fastest MS-DOS and OS/2 micro in the world."

PC Resource, "ZEOS ... provides quality comparable with IBM or Compaq and does so for about 70% of the price."

PC Magazine, Editor's Choice, "The ZEOS blows away every other computer... a smart choice."

**ZEOS '386 SYSTEMS.
A SMART CHOICE
INDEED!**



Get Started Fast and Easy!
ZEOS '386-25 Desktop.
64K Cache, 85MB IDE
drive, 1MB Memory.
ONLY \$2295

This is the place where high performance begins. Your own ZEOS 25MHz '386 caching system. \$2295. Incredible!

- Ultra High Speed 64K SRAM Cache, providing Zero-Wait State performance vastly superior to page/interleave memory schemes.
- Genuine Intel® 80386 25MHz CPU. Full 80387 and Weitek® math coprocessor support.
- 1MB of High Speed DRAM, expandable to a total of 16MB.
- Ultra Fast 85MB IDE Hard Drive, Teac® 1.2MB Floppy Drive.
- ZEOS 14" High Res amber monitor with Tilt/Swivel Base. Includes Genuine Hercules® brand graphics controller.
- ZEOS/RS 101 key SpaceSaver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel and Game ports.
- 1-32, 6-16 and 1-8 bit expansion slots.
- Rugged ZEOS 5-bay desktop case with 250 Watt TurboCool® power supply for increased component life and system expandability, an important extra at no additional cost.
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty with Express Parts Replacement.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

EASY DRIVE UPGRADE

Upgrade from 85MB to 124MB for only \$195 or go up to 200MB for only \$525. Packages with our 124MB standard go to 200MB for only \$330!

Circle 745 on Reader Service Card.

PACKAGES



ZEOS '386-25 Desktop!
124MB IDE Drive, 4MB
Memory, 1024 VGA Color,
Windows & More.
ONLY \$3195

For incredible 25MHz speed and power don't miss the ZEOS '386-25 package. Loaded and ready to go!

- Ultra High Speed 64K SRAM Cache. It races right past other 25MHz systems and never looks back!
- Intel® 80386 25MHz CPU. Full 80387 and Weitek® support.
- 4MB of High Speed DRAM, expandable to a total of 16MB.
- Ultra Fast 124MB IDE Hard Drive, Teac® 1.2MB and Teac® 1.44MB Floppy Drives.
- ZEOS 14" High Res 1024x768 VGA Color monitor with Tilt/Swivel Base plus High Speed 16-bit VGA 1024 color graphics card with 512K video RAM.
- ZEOS/RS 101 key SpaceSaver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel and Game ports.
- 1-32, 6-16 & 1-8 bit expansion slots.
- Rugged ZEOS 5-bay desktop case with 250 Watt TurboCool® power supply for increased component life and system expandability, an important extra at no additional cost.
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse!
- Full ZEOS Satisfaction Package.

ZEOS '386 33MHz Vertical
system. Perhaps the fast-
est in the world! 124MB
IDE, 4MB Memory, 128K
Cache, VGA Color &
Options Galore.
ONLY \$3695

You simply cannot buy a better 33MHz '386 system. Feature for feature nothing can touch the ZEOS '386-33!

- Ultra High Speed 128K SRAM Cache. Coupled with the fastest motherboard on the market. Unbelievable performance. Believe it!
- Genuine Intel® 80386 33MHz CPU. Full 80387 and Weitek® math coprocessor support.
- 4MB of High Speed DRAM, expandable to a whopping 32MB on the motherboard.
- Ultra Fast 124MB IDE Hard Drive, Teac® 1.2MB and Teac® 1.44MB Floppy Drives.
- ZEOS 14" High Res 1024x768 VGA Color monitor with Tilt/Swivel Base plus High Speed 16-bit VGA 1024 color graphics card with 512K video RAM.
- ZEOS/RS 101 key SpaceSaver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel and Game ports.
- 2-32 and 6-16 bit expansion slots.
- Rugged ZEOS 8-bay vertical case with Twin Cooling Fans. Powered by the 250 Watt TurboCool® power supply for increased component life. Nobody gives you this much!
- Microsoft® DOS 4.01 with Disk Cache Software *plus* Microsoft Windows™ 3.0 and mouse!
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty with Express Parts Replacement.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

ORDER NOW TOLL FREE:
800-423-5891

Fax Orders Dial: 612-633-1325
 In Minnesota Call: 612-633-4591
 Outside US/Canada: 612-633-6131
 MasterCard, VISA, AmExp, Z-Card
 and COD.

ZEOS '386 Systems.

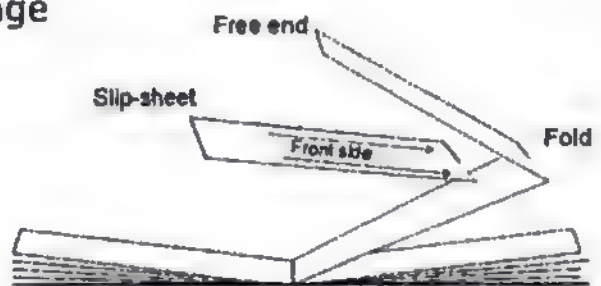
Five
~~Four~~ Times
Editor's Choice

“Deserving of this award is
the ZEOS 386-33 with its superior
combination of performance,
expandability, and price.”

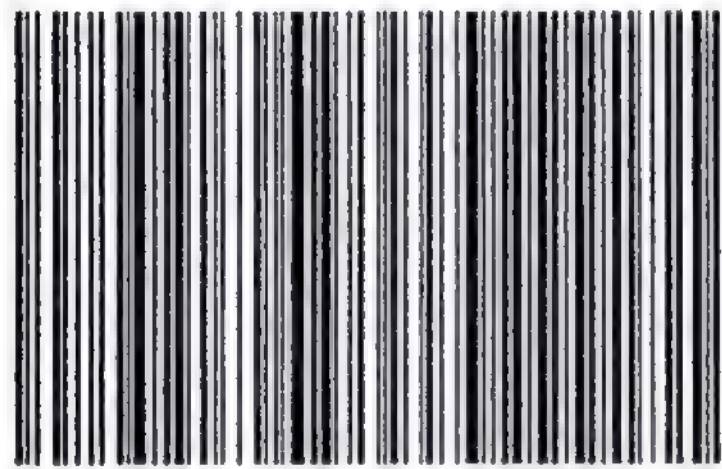
— *PC Magazine, On Why the ZEOS
386-33 Wins Editor's Choice.*

Call Now!
800.423.5891

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

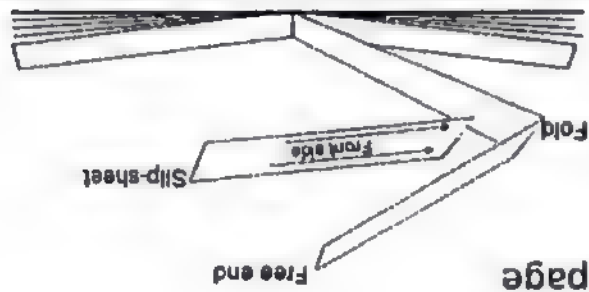


GbsSlipSheet-001

Inverted Foldout slip-sheet

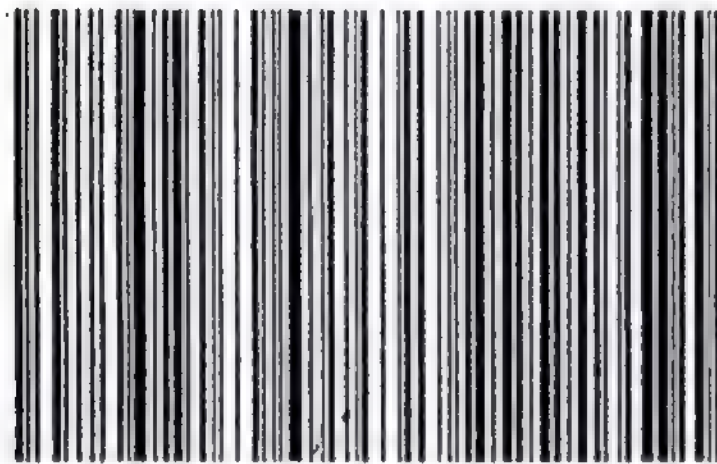
Folded edge of the page

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-001B

Back

1. Follow instructions on the other side



Take it from the experts. ZEOS builds the best '386 systems! "Quality comparable with IBM or Compaq... Excellent Value... Blows away every other computer... ZEOS is top drawer... Unbeatable... Top Honors... A smart choice!"

The industry experts love ZEOS systems.

And you will too. Why?

Because ZEOS really does build the very best '386 systems you can buy. In naming the ZEOS '386-33 *Editor's Choice*, *PC Magazine* said ZEOS shows "that you needn't be among the most expensive to be the best." But what does that mean to you?

It means that when you purchase your new ZEOS '386 you will receive more Performance, superior Quality, and better Support than you can get anywhere else. Take performance for instance.

CACHE MEMORY MEANS PERFORMANCE!

That's why each and every ZEOS '386DX system has a minimum of 64K SRAM Cache standard; *our 33MHz screamers come standard with a 128K*

Cache. Having an on-board memory cache is important in realizing the full potential of any '386 processor. That's why only low end '386DX systems are sold without a Cache. That's why ZEOS gives you a Cache, and all the extra performance that comes with it!

And it's not only the Cache that's fast, so is everything else. In choosing the ZEOS '386-33 as *Editor's Choice*, *PC Magazine* noted "ZEOS International designed this machine for speed—and came up with a system that topped four of our benchmark tests and excelled on the remaining ones." Designed for speed. Absolutely.

Speaking of speed. Standard in your new ZEOS '386 will be one of our *incredibly fast* 85MB or 124MB IDE hard drives. These babies were designed for the '386 and they come packing all the speed you'll need. Like *PC Magazine* said, ZEOS designs for speed. And for Quality Too.

ZEOS QUALITY. SECOND TO NONE.

When you buy your new ZEOS system you are buying *absolute Quality*. As an example, every ZEOS '386DX system comes with a 250 Watt TurboCool® power supply. They cost more, they're better too. Much Better. We invest more in our power supplies and cooling systems to help assure you years of trouble free operation. Even the small details can make the difference.

Like our floppy drives. We use only genuine Teac®. They are the best money can buy. The same is true of *all* the components of your system. Only *the very best* are used. Everything is top notch. Top quality. Top Value.

You'll especially like the value you find in our money saving ZEOS system packages. And when you opt for any package with 4 Megs of memory, we also include the new version of Microsoft®

Sim
the I

10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but four times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editors Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

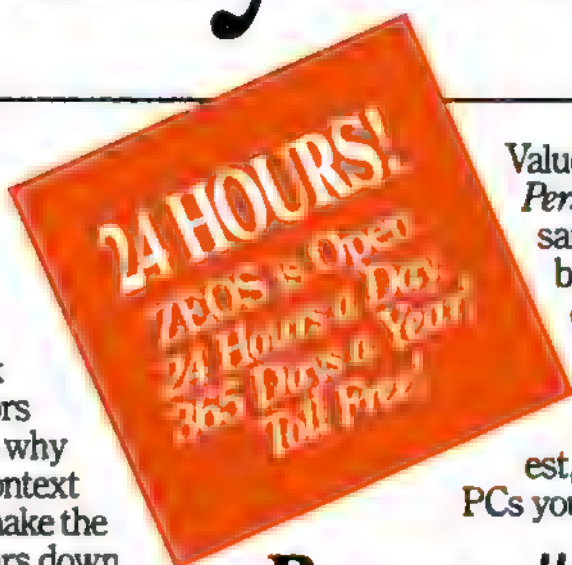
Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent."



Value: Excellent."

Personal Computing said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, we *Guarantee it!*

Order Now Toll Free
800-423-5891

FAX Orders Dial: 612-633-1325
In Minnesota Call: 612-633-4591
MasterCard, VISA,
AmEx, Z-CARD
and COD
Open 24 Hours a
day, 365 Days
a year.



Apply Now for the Z•CARD!

Your own ZEOS® Revolving Charge Account

SEND FOR YOUR ZEOS CREDIT CARD

Now you can send for your own ZEOS Credit Card. It works just like a MasterCard or Visa for ZEOS purchases.

Fill out your Z•Card™ Application and mail it today to ZEOS International, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112. We'll give you a call as soon as your credit line is established!*

Please complete all appropriate sections, *providing at least two years residence and employment history*. If you are self-employed, please be sure to complete "Self Employment Information" section. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This Form Must Be Signed To Process Your Order.) All Financed Purchases Are Subject To Credit Approval. **If You Have Any Credit Questions, Please Call 800-421-8942 For Assistance. Thank You!**

A married person may apply for individual credit. I am applying for (please check appropriate box):

- ☐ **JOINT CREDIT** with another person. Complete entire application.
- ☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
- ☐ **INDIVIDUAL CREDIT.** Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS: YOU MUST DISCLOSE YOUR MARITAL STATUS:

☐ married ☐ unmarried ☐ legally separated

A. YOUR PERSONAL INFORMATION

Name _____

Home Phone (_____) _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

Previous Address _____

City _____ State _____ Zip _____

Employer _____ Since? (Mo./Yr.) _____

Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____

Previous Employer _____ From - To _____

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.

Additional Monthly Income \$ _____ Source: _____

Name & Address of Nearest Relative Not Living With You _____ Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No Savings Account ☐ Yes ☐ No

	Y/N	How Many?		Y/N	How Many?
Bank Loan	_____	_____	Dept. Store Charge Card	_____	_____
VISA	_____	_____	Credit Union Account	_____	_____
MasterCard	_____	_____	Other Major Charge Cards	_____	_____
Finance Company Loan	_____	_____			

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____

Joint Applicant's Employer _____ Since? (Mo./Yr.) _____

Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____

Date _____

Joint Applicant's Signature _____

Date _____

FOR MARRIED WISCONSIN APPLICANTS:

I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

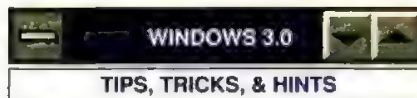
Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH—THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDITWORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW.

*Financing not available in Alaska, Hawaii or outside the continental U.S.



One of the most-common complaints about *Windows 2.x* was that it only supported two serial ports. *Windows 3.0* supports up to four, but you need to know some tricks to make these extra ports work in 386 enhanced mode. I/O ports for COM1 and COM2 were formalized by IBM from the day the first PC shipped. There is no such standard for COM3 and

COM4, but there have been widely accepted values used for these ports.

Windows 3.0 in 386 enhanced mode has to control the I/O ports, and it assumes default values different from the common ones and tends to give less than useful error messages like "The COM port is currently assigned to a DOS application." So if you have a COM3 or 4 and it doesn't

work, the first thing you should do is add the following lines (one or both depending on what port configuration you have) to the section of *SYSTEM.INI* headed [386Enh]:

```
COM3Base=3E8h
```

```
COM4Base=2E8h
```

If you have both COM1 and 3 that use IRQ lines, or a COM2 and 4 that use them, then

MEMORY MATTERS

by Barry Simon

Microsoft Windows 3.0 can use three types of memory management that correspond to three different kinds of computers. If you have an XT-style 8088 machine, you can use real-mode memory management. If you have an AT-style 80286, you can use real mode (as if you only had an 8088 machine) and *Windows'* standard mode, which takes advantage of the richer memory management options in the 286 chip. If you have an 80386- or 80486-based machine, you can use real, standard, and 386-enhanced modes to take full advantage of the 386 chip's memory juggling. A 386 or 486 machine can act like a 286 or 8088 machine when it needs to, although it obviously runs most powerfully as a 386 machine.

Regardless of the computer you own or decide to emulate, you'll have to tinker with the way *Windows* manages memory if you want to maximize performance.

8086 and 8088 processors can only address 1MB RAM directly, although a bank-switching scheme called EMS (Expanded Memory Specification) allows indirect access to much more memory. *Windows'* real mode will run on such CPUs and so will EMS if you have it in the form of EMS memory boards or software EMS emulators.

With an 8086/8088 processor, memory up to 640K is available for ordinary program storage. The memory between 640K and 1MB is used by the video display and built-in ROM, but there is often free address space in this region called upper memory blocks (UMBs). EMS requires a 64K UMB to operate.

80286s and more-powerful processors can access memory above

1MB—extended memory—but they can do so only in protected mode of memory management, which is incompatible with the 8086's real mode. To access extended memory, the 80286 chip must switch out of real mode and into protected mode. In the standard and 386-enhanced modes, *Windows* runs applications in protected mode most of the time. When DOS's services are needed, to read or write a file, for example, *Windows* must switch back to real mode to call DOS.

In standard mode, which normally runs on all 286-, 386-, and 486-based machines, *Windows* runs DOS sessions by relocating itself to extended memory. It then switches to the CPU's real mode and runs DOS almost as if *Windows* wasn't there at all. While standard-mode *Windows* runs DOS, virtually all of *Windows'* other functions are unavailable, and you can run only one DOS session at a time.

The 80386 and 80486 have a third mode, virtual-8086 mode, in addition to real mode and protected mode. This allows DOS sessions to run anywhere in memory, by remapping addresses so that the programs think they are running in real mode below 1MB. Because several DOS programs can remain in memory, multitasking DOS applications can be the end result.

Normally, the three *Windows* modes—real, standard, and 386-enhanced—are matched to the three kinds of processors: 8086/8088, 80286, and 80386/80486, but there are exceptions. If you are running only *Windows* applications or don't care about DOS multitasking, standard mode is recommended—it will be 10 to 20 percent faster than 386-enhanced mode. If

you still have some *Windows 2.x* applications, you may need real mode to run them. With some extremely touchy *Windows 2.x* applications, for instance, *OmniPage 386*, Version 2.1, you may even have to use the runtime version of *Windows 2.x* that came with the program, rather than *Windows 3.0* in real mode.

OPTIMIZING REAL MODE

If you have hardware-supported LIM 4.0 EMS memory, *Windows* in real mode will swap large programs to EMS. This may allow you to run more applications, but since some critical code must stay in the unswapped region, you may run out of memory if the swap region is too large. If you don't want EMS use in real mode, use the following /E command-line switch to load *Windows*:

```
win /r /e
```

If you want to adjust the point in memory usage where *Windows* begins to swap to expanded memory in order to have more unswappable memory, use /L+xx, where xx is a number. This is recommended if you get "out of memory" errors even though *Windows* reports free memory. If you want to force *Windows* to use only the UMB page frame of 64K for swapping, use /L+200.

OPTIMIZING STANDARD MODE

In standard and 386 enhanced modes, *Windows* sets aside two areas called the USER and GDI local heaps. Each of these areas is limited to 64K. If you call the "About" choice in the Program Manager, it will display the amount of free memory and also the percentage of "Free System Resources," which is a measure

you'll also need to add the following line:

```
COMIrqSharing=1
```

Generally, modems and mice use IRQ, but printers do not.

Finally, unlike many other applications, *Windows* looks at the BIOS data area to check that the ports are BIOS initialized. On older systems, the BIOS doesn't do this, so you'll need an external program to

of the remaining 128K.

If you get "out of memory" errors but are sure you have a lot of memory left, it's likely that one of these areas is filling up. The only solution is to close some applications. You may even find it necessary to exit and restart *Windows*.

OPTIMIZING 386-ENHANCED MODE

Windows will use a rather efficient method of swapping memory to disk if it is running in 386 enhanced mode and runs out of free RAM. You will pay a price in performance speed when *Windows* does this, however, and it may be preferable to close some applications to avoid the use of virtual memory on disk.

USING 386 MEMORY MANAGERS

A *Windows*-specific version of Quarterdeck's *QEMM*, Version 5.11, is available now, and a *Windows* version of Qualitas' *386MAX*, Version 5.1, should also be shipping at this time. These programs let you place drivers and TSRs in memory above 640K, thereby increasing the free memory in your DOS sessions, and still run *Windows* in standard or 386-enhanced mode—if you have *QEMM*. Oddly, *386MAX* supports real and 386-enhanced modes, but not standard mode. There is, however, a trade-off when you use these programs. *Windows* uses free high-memory space as buffer space during DOS operations, so the more space taken up by your drivers and TSRs, the slower disk operations will be when *Windows* uses DOS. However, a good cache program may improve the condition. ■



initialize them. On PC MagNet, in Section 2 of Utilities Forum under the name COMSET.ZIP, you'll find a simple, free program by David Macchia that will do this initialization. To see if this will help you, run MODE with COM3 or COM4 as a parameter if you have DOS 3.3 or later. If MODE answers "Illegal device name—COM3," then COMSET.ZIP should help. —Barry Simon

RUNNING WINDOWS APPLICATIONS

DOUBLE-CLICK ALL OVER THE PLACE

With *Windows* applications and *Windows* itself, it pays to experiment with the mouse. Try double-clicking (that is, quickly click the left button twice) in various spots on-screen.

In many object-oriented programs, double-clicking on an object will bring up a properties dialog box. And in many places, double-clicking selects and then makes a choice. For example, double-clicking on an icon on the desktop causes the program represented by the icon to become the active on-screen. Double-clicking on an item in a list box is the same as clicking on the item to select it and then hitting enter to choose.

The SAA specifications say that double-clicking in text is supposed to select the word the mouse cursor is on, but not all programs implement this. Experiment with your application to see how it works.

Even empty spaces often respond to double-clicks. Double-click on an empty

spot on the desktop and the task switcher will pop up. Double-click on a blank spot on a title bar and the window will be maximized if it isn't already, or will be restored to partial form if it is currently maximized. There's no need to click on those dinky arrows in the corner except when you want to minimize.

Double-clicking has special functions in some applications. In *Microsoft Word for Windows*, double-click on the ruler and invoke the paragraph format dialog. Double-click on the ribbon and invoke the character format dialog.

—Barry Simon

CHECK YOUR PROGRAM= LINE IN WIN.INI

The WIN.INI file for *Windows* 3.0 should include the line:

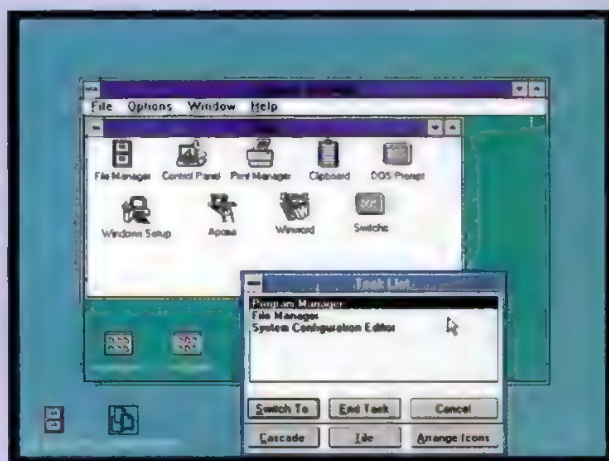
```
Programs=com exe bat pif
```

The *Windows* 2.x equivalent did not include "pif". If you installed *Windows* 3.0 by updating from *Windows* 2.x, check that the line is correct. Without the "pif" there, you'll get an error message if you try to run a program by clicking on its PIF file. —Barry Simon

UNDERSTAND SHELL=, LOAD=, AND RUN=

To make *Windows* 3.0 work the way you want it to, you should understand the parameters that Microsoft provides to let you take charge of your desktop. The keys to taking control are three lines in the SYSTEM.INI and WIN.INI files.

There is no rule that forces you to use Microsoft's Program Manager (PROG-



Double-clicking on an empty spot on the desktop will bring up the *Windows* task switcher.

MAN.EXE) as your *Windows* shell, although *Windows* Setup installs it as the default. As impressive as the Program Manager is, it can't meet the needs of every user and there are plenty of alternatives for organizing and launching your programs. Near the beginning of your SYSTEM.INI file, look for the line `SHELL=PROGMAN.EXE` and replace `PROGMAN.EXE` with the name of your alternate shell. This can be any program that can launch other programs, including Microsoft's File Manager (FILEMAN.EXE) or even the old MS-DOS Executive (MSDOS.EXE), well known to users of older versions of *Windows*.

Another easy way to customize your desktop is by editing the lines `LOAD=` and `RUN=` found near the top of your WIN.INI file. When you restart *Windows*, any program which you place after `LOAD=` will be started as an icon. This way, any utilities or programs that you use frequently will be ready for use, but tucked away as an icon. Multiple programs can be started by listing them on the `LOAD=` line with a space between each program, like this:

```
LOAD=clock calculator
      c:\winword\winword.exe
```

In contrast, programs added to the `RUN=` line will start in a window, forcing the shell program to start in an iconized state.
—Paul Murphy

RUN A PROGRAM FROM A DIRECTORY IT ISN'T IN

The properties dialog box in the Program Manager only has room to specify the



name of a single directory. Where it asks for the program's name, you can fill in the full path name. What do you do if you'd like to run the program from a data directory different from the program directory?

Here's a method that's clumsy but effective. Suppose that your program is `c:\windows\applications\excel\excel.exe` and you would like a Program Item in Program Manager to start in the directory `d:\projects\widgets\budgets`. All you need to do is place the program directory, in this case, `c:\windows\applications\excel`, in your DOS path and lie to Program Manager, telling it that the program's name is `<datapath>program`, where `<datapath>` is the path from which you want to start the program. In this case, you would tell Program Manager that the program you want to run is `d:\projects\widgets\budget\excel.exe`. When you have entered that name and then closed the dialog box that you use for creating or modifying a Program Item, *Windows* will complain that the file wasn't found—but if you click OK, *Windows* will accept it.

If you then click on this program entry in the Program Manager, *Windows* will happily switch to the directory `d:\projects\widgets\budgets` and attempt to run `excel.exe`. Since `excel.exe` is in your path, it will run, and in the right directory.

—Barry Simon

USE WIN.INI ASSOCIATIONS

In your WIN.INI file, you'll find a section that starts with

[Extensions]

and includes lines like

```
cal=calendar.exe ^.cal
crd=cardfile.exe ^.crd
```

These lines let you associate files that have a given extension with a specific executable program. For example, the line that begins "`crd=`" means that any time you double click on a file with the .CRD extension, *Windows* will launch Cardfile and tell it to load the file you clicked on automatically.

When using this technique, there are several things to keep in mind. First, the program need not be a *Windows* application. If it's a DOS program, *Windows* will launch a DOS session to run it. The program could even be a batch file. Second, you can include a directory name in front of the program name, in which case the program need not be in your path. Finally, be sure to include the .EXE, .BAT, .COM, or .PIF extension.

As an example, suppose you use compressed .ZIP files and you have PKUNZIP in the directory `E:\tools\compression`. If you would like to just double click on a .ZIP file in order to unzip it, simply add the following to the Extensions section of WIN.INI:

```
zip=E:\tools\compression\pkunzip.exe
  ^.zip
```

You can edit WIN.INI with *Notepad* or by using SYSEDIT (see the tip on SYSEDIT above).—Barry Simon

USE THE CLIPBOARD AS A TRANSLATOR

You probably think of the *Windows* clipboard as something like your word processor's buffer: useful for simple cut-and-paste operations on text, but with the advantage of operating between applications. And it does graphics.

But the *Windows* clipboard is much more than that. It can store what you cut or copy in multiple formats. *Excel*, for example, lets you copy in more than ten formats. This makes the clipboard an ideal translation utility.

Suppose you have a *Windows* word processor that can't read TIFF files and a paint program that can. If you load the TIFF file into the paint program and copy it to the clipboard, it may be that the copy



To run a program in a data directory, just tell *Windows* the program's directory is really your data directory and place the program directory in your path.

WITNESS THE DAWN OF THE 9ms ERA.

THE NEW HARDCARD II XL.

More speed, more room, more power, less price.

We developed a drive that delivers truly remarkable performance for 286/386 systems. With a price competitive to your typical, standard, everyday 28ms disk drive.

More speed. Hardcard II XL's™ 9ms effective access time¹ and 1.4 MB per second sustained transfer rate² mean your system runs 8 or 9 times faster than one with the typical 28ms drive.

More room. 50 and 105 MB capacity. More power to take Windows™ 3.0 and OS/2® to new performance heights.

More power. You'll literally feel the difference in your system.

It's more of everything. Except price.

For more information on your nearest dealer, call 800-624-5545 in the U.S.

and Canada. **Plus** 

CIRCLE 147 ON READER SERVICE CARD

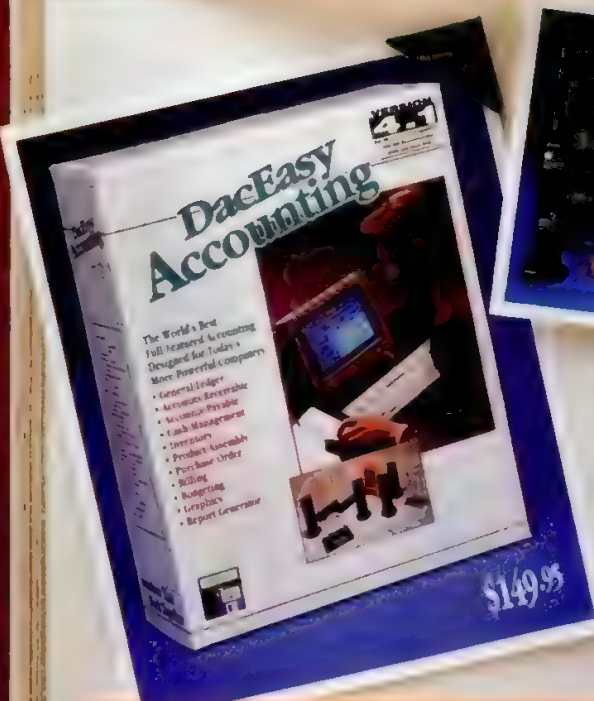
INTRODUCING 

XL

HARDCARD II XL 

¹ Time at random access time using a 100MB disk. ² Sustained transfer rate achieved by Power Meter on a Compaq Deskpro 386 33MHz system.
© 1991 Plus Development Corp. Plus and Plus logo are registered trademarks and Plus Hardcard II XL is a trademark of Plus Development Corp. OS/2 is a registered trademark of International Business Machines Corporation. Windows is a trademark of Microsoft Corporation.

Meet the First Family of



Easy-to use, sophisticated accounting with an award-winning heritage.

Whether for business accounting or personal financial management, the DacEasy family of award-winning accounting software has something for everyone.

It seems that every time you look at a personal computer magazine, DacEasy has won another award. DacEasy Accounting 4.1 has picked up three new awards just this year. Truth is, DacEasy Accounting has won more awards than all of its competitors combined. Here's why.

DacEasy™ Accounting 4.1 is sophisticated enough for an accountant, yet easy enough for a novice to use. With Accounting 4.1, you can invoice customers, track

"For versatility and ease of use, DacEasy is hard to pass up."

-Price Waterhouse Report on Low-Cost Accounting Software
PC Magazine, April 10, 1990

sales, establish a budget, control inventory and assembly, pay bills, generate purchase orders, forecast future business performance, generate custom reports, and create colorful graphic presentations.



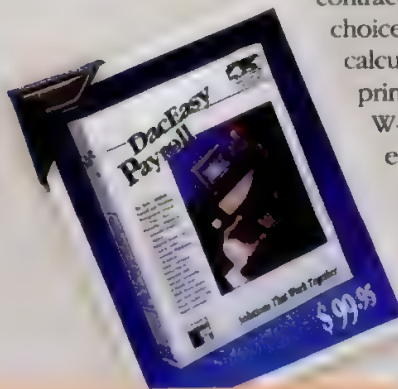
DacEasy wins PC World's World Class Award an unprecedented fifth year in a row!

With its intuitively organized menu environment and instant access to on-line help, DacEasy Accounting 4.1 makes business accounting less intimidating. And since all 11 of its modules are completely integrated, Accounting 4.1 requires just one manual that includes a primer on the basics of accounting.

Over a half-million businesses in small towns and big cities across the U.S. and in 17 countries worldwide trust DacEasy Accounting to manage their business finances.

DacEasy™ Payroll 4.1 is the perfect match for your business. Versatile Payroll 4.1 manages salaries, wages and

contract labor and gives you a choice of four pay periods. Tax calculations are automatic, and printing your payroll checks, W-2's and 1099's couldn't be easier. And Payroll 4.1 integrates with the General Ledger of Accounting 4.1 or you can use it as a stand alone program. As expected, DacEasy Payroll 4.1 offers all the features and more for a value-leading price.



The complete payroll and personnel management solution.

For even greater value, get the **DacEasy™ BonusPack** with Accounting 4.1, Payroll 4.1 and the DacEasy Video Tutor for one great low price.

Accounting 4.1, Payroll 4.1, a FREE Video Tutor, and a great price!

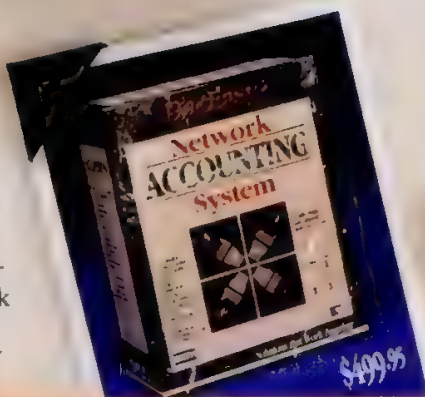
For the best network accounting software, check out the **DacEasy™ Network Accounting System** with all the features of Accounting 4.1, Payroll 4.1 and a free Video Tutor.



Hardware Requirements IBM or compatible PCs (Light Checkbook for Macintosh-Plus, SE, II), Accounting 4.1-640K, Hard disk, DOS 3.1 or later, mouse optional. Payroll 4.1-512K, Hard disk, DOS 3.1 or later, mouse optional. Sylvia Porter's RapidoTax 512K, Hard Disk, DOS 3.1 or later. Accounting 3.1-512K, 2 disk drives. DOS 2.1 or later. Light Checkbook Accounting (PC-256K, One Disk Drive, DOS 2.1 or later. Macintosh is a trademark of Apple Computer, Inc. DacEasy, Light, and RapidoTax are trademarks of DacEasy, Inc.

Accounting Software.

The DacEasy Network Accounting System is compatible with all the popular LAN's, and includes options and capabilities found in network accounting systems costing thousands of dollars more. So if you need your accounting on a network, DacEasy offers award-winning performance at a great price.



The newest, most powerful member of the DacEasy family!

"DacEasy Accounting Network System, the product to watch for."

-Lotus Magazine
December, 1990

You can file your 1990 taxes with confidence with **Sylvia Porter's RapidTax™**. This easy-to-use 1040 program features a simple interview filing option, built-in IRS Tax Tips and an



Introducing the tax expert in the family.

electronic filing software for quick refunds and DacEasy Light Checkbook Accounting for FREE.

If your business has an older, less powerful computer, DacEasy has a powerful accounting solution to fit your needs. **DacEasy™ Accounting 3.1** has many of the features found in Accounting 4.1, with reduced hardware requirements and a reduced price of \$99.95.

If your business accounting needs are simple, or you want to get a grip on your home finances, **DacEasy Light® Checkbook Accounting** is the perfect choice for you. Designed to look like familiar checks and credit-card slips, DacEasy Light's screens make financial management easy, even for the most inexperienced accounting lightweight. And there is a great new version made just for Macintosh users, too. For PC or Macintosh alike, you get the best small

CIRCLE 502 ON READER SERVICE CARD

business or personal accounting for less with DacEasy Light Checkbook Accounting.

Quick and easy accounting for home or office.

The DacEasy™ Advantage Club, a great success in its

first year, continues to offer the best value in unlimited priority customer support, plus newsletters, free maintenance revisions and updates, and free Payroll tax tables. For on-site assistance, a nationwide network of **DacEasy™ Certified Consultants** are ready to serve you. There's also a full selection of classroom seminars, self-paced interactive materials and a Video Tutor to help you learn about computerized accounting with DacEasy. So for the best features, most choices, and highest level of support, get to know the DacEasy family.



Visit your local dealer or to order call:

1-800-877-8088.

In Canada call (416) 940-3314

Before making any accounting software purchase, order the DacEasy System Selector disk at no risk.*



- ☐ Please send an interactive DacEasy System Selector disk for \$5.00 (fully refundable or apply to purchase)
- ☐ Please send information on the DacEasy Accounting family for \$_____
- ☐ Please send _____ for \$_____

In Texas please add 8 1/4% sales tax Disk Size: ☐ 3.5 ☐ 5.25

Phone: _____
Name: _____ St. _____ Zip _____
Address: _____
City: _____
Method of Payment: ☐ Check ☐ Visa ☐ MC ☐ AmEx
Exp.: _____

Card #: _____
Signature: _____

DacEasy, Inc.

17950 Preston Road • Suite 800 • Dallas, Texas 75252

inlco

***30 Day Money-Back Guarantee on software purchased direct from DacEasy!**

Before you run out and spend five or six thousand dollars for a 386SX notebook PC, we seriously suggest you take a close look at Samsung.

We've just introduced the NoteMaster[™] 386S/16. It has the features of a Compaq notebook PC for about half the price.

NoteMaster has a better screen, a more responsive keyboard and can be upgraded with a coprocessor, modem or more memory without even opening up the case. It's also slimmer and lighter than Compaq. And it comes with our toll-free customer service hotline so you get answers directly from our product experts. As one of the world's largest manufacturers, we make most of our own components, so you realize considerable savings with superior quality control.

Call 1-800-624-8999, extension 85 for more information or the name of your nearest dealer.

You'll discover you can own the best without paying the most.

	Samsung NoteMaster 386S/16	Compaq LTE 386/20
Processor	16MHz 386SX	20MHz 386SX
Dimensions	8.5" x 11" x 2.1" 7 lbs.	8.5" x 11" x 2.2" 7.5 lbs.
Display	VGA Sidelit CCFT Paper White VGA LCD 256KB Video RAM 64 grey shades support	VGA Edgelit LCD 16 grey shades support
Keyboard	Standard AT-compatible 3mm key travel depth	Enhanced keyboard 2.5mm key travel depth
Memory	1MB expandable to 5MB	2 MB expandable to 10MB
Software Incl.	Laplink III MS-DOS Windows 3.0	Not available
Support	Toll-free 800 number On-line modem support	Not available
Price	20MB - \$3999 40MB - \$4499	30MB - \$6499 60MB - \$6999



SAMSUNG

Technology that works for all of us.

Lower your budget not your expectations.



All brand and product names are Trademarks or Registered Trademarks of their respective companies. Copyright 1990 Samsung Information Systems America, Inc.

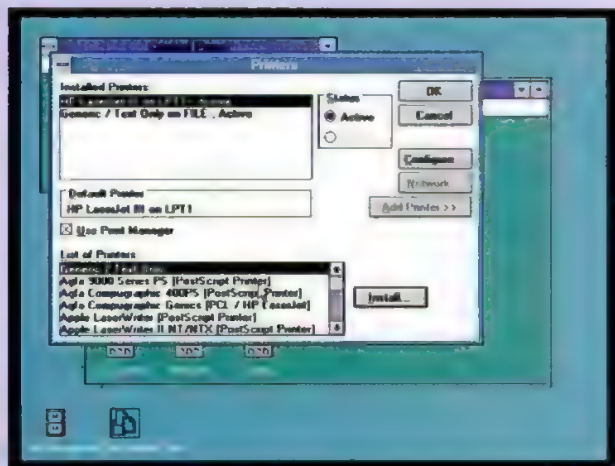
CIRCLE 316 ON READER SERVICE CARD

will include a *Windows* bitmap as well as a TIFF file and that you'll be able to paste the bitmap into the word processor.

Or, suppose you've written a letter in *Word for Windows* and want to send it via electronic mail using *Crosstalk for Windows*. Since the letter is heavily formatted with codes that your e-mail server won't understand, you may think you need to

the "File/Printer Setup" menu item. If you choose the text printer, you'll be prompted for a file name when you print.

One warning: print only unjustified text this way. The result of printing justified text, at least in *Word for Windows*, is bizarre.—Barry Simon



In the Printer Configuration section of the Control Panel, the TTY driver appears first on the list when you click "Add Printer." When you are finished, your list of installed printers should include "Generic/Text Only on FILE: ,Active."

save it as an ASCII file first. You don't. Load the letter into *Word for Windows*, copy it to the Clipboard, paste it into *Crosstalk*, and the letter will be pasted in as an ASCII message.—Barry Simon

PRINT ASCII TEXT FROM ANY PROGRAM

It's often useful to print unformatted output from a word processor or other text-based *Windows* application. Here is a way to do this from any such application. You'll need to install an additional printer driver, so have install disk 5 ready (in the 5.25-inch version), start Control Panel, and pick Printers and then the "Add Printers" button. On the resulting list, the first choice will say "Generic/Text only." Double-click to install TTY.DRV from disk 5.

After picking OK, choose the "Configure" button and scroll the list of ports until you find "FILE." By clicking on this entry you'll attach the Generic Text printer to a disk file instead of a port, and you'll be able to choose the file name when you print. After choosing OK, activate the printer with the radio button at the dialog box with the list of installed printers.

Most applications let you switch from the default printer to the Generic Text printer without going out to Control panel. For example, in *Word for Windows*, use

RUNNING DOS SESSIONS

USE ALT-TAB

When switching out of a full-screen DOS window, it is often best to use the Alt-Tab hot key. This will call up the name of another window in a bar at the top of your application. Hitting Alt-Tab successively without removing your finger from the Alt-key will cycle through the names of all applications that you're running under *Windows*. This method is quicker than using Alt-Esc, which switches entire windows, loading complete programs as you cycle through applications. It's also faster than hitting Ctrl-Esc, which will switch you to the *Windows* desktop and call up the task list.—Barry Simon

LAUNCH A BATCH FILE AND END AT A DOS PROMPT

If you want to go to the DOS command line, you can double-click on COMMAND.COM and open a DOS session, but it will be a dumb DOS session with none of the TSRs that you may normally use to tame DOS. Suppose you want to load a macro program or something like

SideKick in the DOS partition before you run a DOS application. You can put all these programs in a batch file, but when the batch file ends, *Windows* will try to close the partition. You can load TSRs, but they won't do you any good because the DOS prompt will no longer be available at the end of the batch file.

How do you load your TSRs from a batch file and still get a DOS prompt at the end? It's simple: make "command" the last line in the batch file. That loads a DOS prompt. When you finish with DOS, type EXIT and the partition will close.

—Barry Simon

AVOIDING TROUBLE

BACKUP ALL SYSTEM AND WINDOWS FILES

Backing up is always a good idea, but it's an especially good idea with critical *Windows* files. These backups are not necessarily meant to protect you from disk crashes but rather as protection against third-party programs and *Windows* itself. You can keep the backups on your hard disk. Of course, you should also back up to tape or floppy disks as part of your regular operating procedure.

Start with WIN.INI and SYSTEM.INI. Copy them to WIN.INK and SYSTEM.INK (the "k" comes from BAK). Make backups before you install any program and then try to determine what changes the installation program made.

Also backup the .INI files that various programs make, and most especially backup PROGRAM.MAN.INI, the file that Program Manager uses to store the names of the groups.

If, despite your best intentions, PROGRAM.MAN.INI gets scrambled, it can be reconstructed fairly easily.

Print out a directory of your .GRP files. Then, in the Program Manager, pick File New, make sure the "Program Group" radio button is selected, and choose OK. Where it asks for Group File, fill in the name of one of your *.GRP files and the whole group you laboriously made will be restored.

Include the .GRP files among those you back up. If disaster strikes when you have no .GRP backups and you want to restore the default Main, Accessory, and Games *Windows*, call up the Program Manager's File Run command and type in "setup -p".—Barry Simon

TROUBLESHOOT UAEs

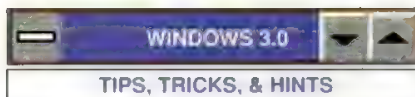
Here are some reasons you may be experiencing the dreaded "Unrecoverable Application Error" message:

1. The DOS version you are using may not be the version prescribed by your hardware vendor.
2. Your hardware and/or network may not have been correctly detected and identified during the *Windows 3.0* installation. Even though Setup may have detected your hardware/network, its choices may have been incorrect, and it may be necessary for you to override the defaults. This is particularly true of 80386 and 80486-based AST machines, 80386-based Zenith machines, and all Hewlett-Packard PCs. Also, *Windows* setup will not properly identify the following networks: 3Com 3+Open LAN Manager (XNS only), 3Com 3+Share, Banyan VINES Version 4.0, LAN Manager Version 1.x (or compatible), and IBM PC LAN program. These can be changed by running *Windows* setup from DOS.
3. You may be using TSRs or network drivers that conflict with *Windows*' memory management.
4. If you are getting UAE's in 386 enhanced mode, you could be caught in the middle of a page-mapping conflict. Try inserting the line

EMMExclude=A000-EFFF

in the [386ENH] section of your *SYSTEM.INI* file.

5. The *Windows* application you are trying to run may not be updated for use with



Windows 3.0. Run such applications in real mode.—Paul Murphy

INSTALL WINDOWS 3.0 VIDEO DRIVERS MANUALLY

Installing a new set of video drivers in *Windows 3.0* can produce potentially disastrous results. The installation procedures supplied by some vendors are dan-

**Windows users from all
over the country talk
to each other through
a variety of
electronic forums.**

gerous to your *SETUP.INF* file and can leave your computer in a state of gridlock. It's much safer to install the drivers by hand and then use Notepad to make the necessary changes to *SETUP.INF*.

First look at the drivers included on your driver disk and make a note of the filenames (they have the extension .DRV). Copy these drivers, and any file with the extension *.386, to your *windows\system* directory.

Then, use the *Windows* Notepad to view the file included with the drivers called *SETUP.INF*. This file includes parameters that must be copied to your

SYSTEM.INI file. Next, you should look for a section under the heading Display. You will notice a list of .DRV files, plus descriptions and other parameters for the new drivers and for the default drivers that originally came with the *Windows 3.0* program. They should look something like this:

```
giga86 = 7:giga86.drv, "GENOA  
EGA 800x600 16 colors",  
"133,96,72", etc.  
giga64 = 7:giga64.drv, "GENOA  
EGA 640x480 16 colors",  
"133,96,72", etc.
```

Highlight the entire line or lines that pertain to the drivers you are adding and choose Edit Copy, copying the lines to the Clipboard.

Next, open *SETUP.INF*, which is in your *windows\system* directory, and find the Display section. Position the cursor beneath the last line in the drivers list and choose Edit Paste, pasting in the new driver description lines.

You should now be able to select the new drivers using *Windows* Setup.

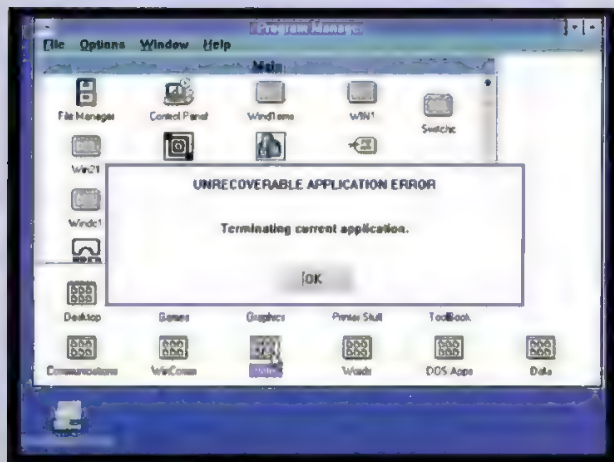
—Paul Murphy

SEEK HELP ON-LINE

Windows users from all over the country talk to each other through a variety of electronic forums. If you log on with your questions and problems, chances are there's a *Windows* guru out there who can provide a solution.

CompuServe has a forum called MSWIN that deals with end-user *Windows* issues (from any ! prompt, type GO MSWIN). Microsoft representatives participate in the conversations and offer advice, and there are utilities and extras like new printer drivers to download. You can also check the MSAPP forum for discussions of Microsoft applications and the WINAPA and WINAPB forums for talk about third-party *Windows* applications.

Of course, CompuServe is also where you'll find PC MagNet, which provides its own *Windows* forum under the Forums/Utilforum menu. Forum leader Paul Murphy (72241,225) and *PC Magazine* Contributing Editor Barry Simon (76004,1664), both of whom authored hints included here, are on-line often and are ready to respond to your messages and questions.—Don Willmott ■



The dreaded UAE (Unrecoverable Application Error) pops up more often than you'd expect. The more you learn about the intricate details of *Windows*, the less often you'll see this screen.

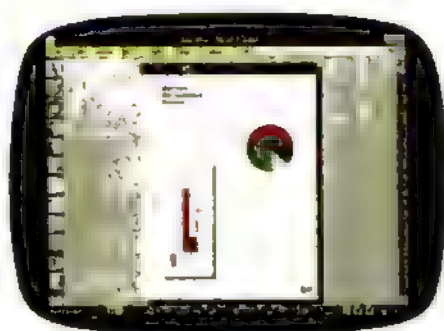
Here's what they're saying about Ami Pro from Lotus.

“Independent User Survey For Windows.^{TM*}”

Word Processing Features	Ami Pro <i>for Windows</i>	Word for Windows	WordPerfect for DOS
Best Overall	50%	22%	16%
Ease of Learning	47%	28%	8%
Ease of Use	52%	23%	8%

*Independently commissioned Windows word processor Usage and Attitude Study conducted November 1990

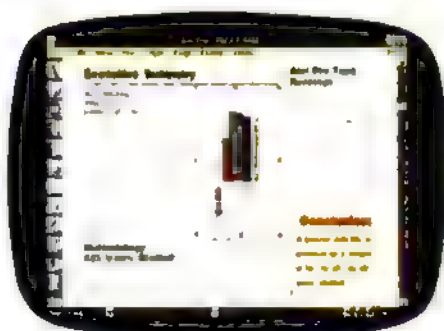
Here's why th



WYSIWYG

No wonder Ami Pro™ for Windows™ is getting rave reviews from users.* They're naturally impressed by its 360 powerful features. And even more impressed with how

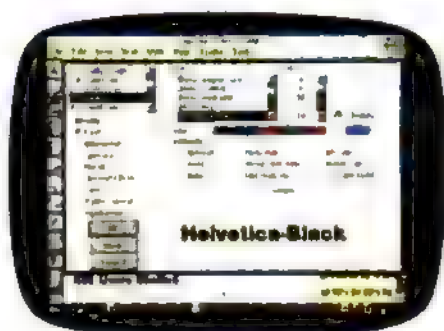
easy it is to use them. Ami Pro has everything you expect in a power word processor, plus important features you can't find anywhere else—like truly interactive WYSIWYG that lets you edit in any of four page views, including full-page view.



FRAMES

Our exclusive "frames" feature lets you quickly place text and graphic elements where you want. Just position your frame anywhere on the page, then fill it with words,

drawings or imported graphics. With a click of the mouse, your text automatically wraps around it.



DIALOG BOXES

Why settle for difficult programs that produce boring documents? Our friendly, interactive Dialog Boxes display all your layout options—and show you the results of

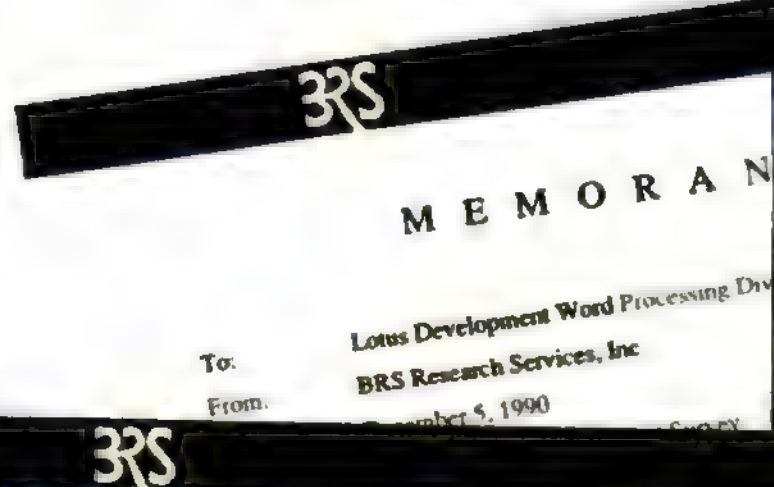
commands before you execute them. So you can change your mind without wasting time.



CHARTS AND GRAPHS

In addition to a built-in drawing feature, Ami Pro instantly generates 168 varieties of presentation-quality charts and graphs, including 2-D, 3-D and perspective. Just type

in the data, or import your chart information from programs like Lotus® 1-2-3.*



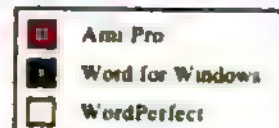
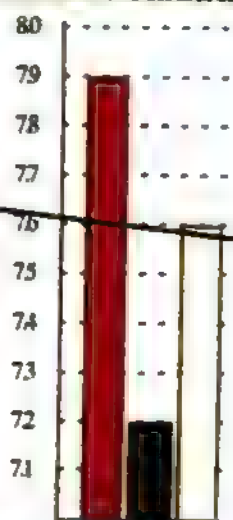
User Study Matches Expert Reviews

User preference research findings have a uncanny resemblance to what word processing and technology experts have been saying all along: Ami Pro is the new standard for word processing in the Windows environment.

The Software Digest rating, for example, places Ami Pro well above Microsoft's Word for Windows and WordPerfect in terms of overall performance.

The user research shows similar results. Ami Pro consistently outranked Word for Windows and WordPerfect in terms of

Software Digest Overall Evaluation



USER PREFERRED WORD PROCESSOR

Executive Summary

Key findings:
Ami Pro preferred 2 to 1

Users prefer Ami Pro from Lotus more than 2 to 1 over Microsoft Word for Windows and WordPerfect. Half of the users studied ranked Ami Pro as the "Best Overall" Windows word processor and overall word processing product. 51.9% said Ami Pro was easier than Word for Windows and WordPerfect; 47.3% said it was easier to learn.

A whopping 63% said they were extremely enthusiastic about the product or like it better than

Methodology: 42

This independent study was conducted in November, 1990. A random sample of word processing users were called and interviewed about their attitudes and user experience.



Easiest to U

They're saying it.

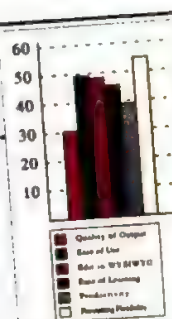
Booth Research Services, Inc.

U M

Ami Pro, the
most important

Booth Research Services, Inc.

REFERENCE STUDY: RANKING FOR WINDOWS



Users Studied
Over a three week period in
of more than 1,000 word
and interviews on preference.

Ami Pro Tops Rankings

Ami Pro came out on top on nearly all of the 17 characteristics ranked by users. An impressive 51.9% of the respondents rated Ami Pro easiest to use, while a whopping 56.5% gave Ami Pro top consideration for "Formatting Flexibility".

Although not cited in this chart, users also ranked Ami Pro as tops in desktop publishing (60.3%), and in getting the most out of Windows (41.2%).

Conclusion:

In general, Ami Pro is preferred by a margin of 56% to 22% by all users studied.

FEATURES COMPARISON

Features	Ami Pro	Word for Windows 5.1	Microsoft Word 5.1
Interactive WYSIWYG	Yes	Yes	No
On-Screen Font and Attributes	Yes	Yes	No
Auto Text Wrap Around Graphics	Yes	No	Yes
Editable View Levels	Yes	No	No
Global Style Sheets	Yes	No	No
Thesaurus Offers Word Meanings	Yes	Yes	No
Visual Dialog Boxes	Yes	No	No
Internal Chart Generation (10 Types)	Yes	No	No



STYLE SHEETS

Ami Pro comes with more than two dozen style sheets that have the page layout already set up and ready to go. So you can produce professionally designed business letters, memos, reports, presentations, newsletters and more—in just the time it takes to type in text.



EXPERTS AGREE

It's easy to see why users prefer Ami Pro from Lotus two to one over Microsoft® Word for Windows™ for overall features and ease of use. And why it's received top ratings from virtually all the industry experts, racking

up such coveted awards as PC World's Best Buy. The Buyers Assurance Seal from InfoWorld. And PC Magazine's Editor's Choice.

"Ami Pro received a score in Ease of Use of the User Interface that was fully 10 points higher than the next highest score, and came in 14 points ahead of the score WordPerfect™ 5.1 drew from its buyers," according to PC Week's Corporate Satisfaction Poll.

PC Magazine says, "Ami Pro has the friendliest interface and the widest range of functions. ...[It] is easier to use than almost any program with comparable powers."***

Ami Pro is the word processing program that takes full advantage of the Windows environment, combining power word processing with the power to create professional documents fast. And with its icons and interactive features, Ami Pro is incredibly easy to learn and use. So what do you say? You've just learned about five major Ami Pro features.

Now to find out about the other 355—and how to get a great upgrade offer—turn the page.

This says it all.

Automatic Backup Automatic Timed Save Block Manipulation Bookmarks

- Named By User • Go To

Charting

- 3D Charting • Edit Chart with Draw Tools • Legends • Multiple Styles Per Type • 7 Chart Types

Copy Text and Graphics

Cursor Movement

- Begin/End of File • Character • Line • Page • Paragraph • Sentence • Top/Bottom of Screen • Word

Customizable Icon Bar

- Choose From Over 45 Functions • Quick Access to Features

Customizable View Level

- 10-400% • Fully Editable

Cut and Paste

Date Insertion

- Today's Date • Date Printed • Date Last Edited • Definable Style

DDE (Dynamic Data Exchange)

- Two-way • Paste Link • Text and Graphics • Via Macro Language

Defaults

- Backup Options • Date Styles • Dictionary Paths • Display Options • Document Path • Draft Mode Colors • Footnote Options • Hyphenation Hot Zone • Pair Kerning • Printer • Icon Bar Icons • Undo Levels • View Level

Delete

Dialog Boxes

Document Annotation

- Notes • Show/Hide • Go To Notes • Date/Time Stamp • Stacked Notes

Document Descriptions

- Author Name • Operator Name • Revision Number • Creation Date • Revision Date • Renameable Fields • User Defined Fields • Display with Directory • Print with Document

Drawing

- Cut/Paste Objects • Circles • Arcs • Squares • Rectangles • Rounded Boxes • Diagonals • Polygons • Polylines • Group Objects • Snap-To Grid • Fill Patterns • Line Widths • Text Rotation • Type Text

File Import/Export

- AdvancedWrite • ASCII • DBase • DCA Final Form • DCA Revisable Form • DIF • E-Mail • Enable • Lotus WKS, WK1, WK3 • Microsoft

- Word • Microsoft Word for Windows • Multimate • Navy DIF • Peachtext • Rich Text Format • Samna Word • Windows Write • WordPerfect • WordStar • Wordstar 2000

File Management Functions

- Copy • Rename • Delete • Move • Sorted File Listing

Font Control

- Unlimited Number of Fonts • WYSIWYG • Limited Only by Printer

Footnotes

- Auto Numbering • Bottom of Page • Endnotes • Number Style Option • Reset Number Option • Separator Line

Forms Capability

- Format Complicated Forms • Fill-In On-Screen • Print on Preprinted Form • Protect Areas

Frames

- Anchor to Text • Auto Text Wrap Around • Background Shade • Contain Text or Graphics • Fixed Position On Page • Lines Around • No Text Wrap Around • No Text Wrap Beside • Overlay Frames • Repeat on Multiple Pages • Resize Frames

Glossary

- Large Record Size • Speed Key Access

Go To

- Any Page Number • Fast Next Item Access • Go To Frame, Footnote, Note, Various Marks in Document

Graphics Control

- Edit PIC Files • Drop Anywhere on Page • Float Graphic w/Text • Place in Box • Proportional Scaling • Fit in Frame • Rotate in Single Degree Steps • X-Y Scaling • Gutter/Binding Margins

Graphics Import

- CGM • EPS • HPGL • Lotus PIC • PCX • TIFF • WMF

Hard Space

Headers/Footers

- Alternating • Floating

Help

- CBT Tutorial Available • Context-Sensitive • Indexed • Point & Shoot • Hypertext Linked • Full Macro Documentation On-Line

Hyphenation

- As-You-Type • Soft Hyphen • Consecutive Hyphen Control • On Paragraph Basis • Hot Zone

Image Processing

- Control Brightness, Contrast of Scanned, Gray Scale TIFF Pictures • Sharpen Edges

- Smoothing • Invert Image

Index Generation

- Generate from List • Mark in Text • Multiple Level Indexing • Hyper Links from Index Back into Document

Insert/Typeover

Kerning

Line Numbering

Line Spacing Control

Macros/Programming Language

- On-Line Macro Documentation • Record/Play • Assign to Function Key • Assign to Menus • Create Menus • Variables • If • Go To Statements • Case Statements • For/Next • Prompt for Input • Subroutines

Math Calculations

Measurements

- Centimeters • Inches • Picas • Points

Merge

- From ASCII Files • From Comma Delimited Files • From DIF Files • From WK* Files • From dBase Files • From Ami Pro File • Label Print Function • Preview Before Print • Three-Level Boolean Conditional Record Inclusion

Open Multiple Documents

Page Breaks

- Manually Inserted • With Paragraph Style

Page Formatting Control

- Margins • Page Size • Snaking Columns • Line Around Page • Line Between Columns • Portrait/Landscape

Page Numbers

- Any Location on Page • Reset Page Number • Five Formats for Number

Paragraph Styles

- Quick Access with Styles Box • With Function Key • Controls: Font, Alignment, Spacing, Page Breaks, Ruling Lines, Bullets, Numeric Format in Table, Hyphenation

Printing Color

Print Options

- Over 130 Printers Supported • Number of Copies • Page Range • Reverse Order • Collate • Print Document Description • Crop Marks • On Preprinted Form • Printer Bin Control for First/Rest Pages • Portrait or Landscape

Real-Time Pagination

Revert to Saved Version

Search and Replace

- Case Insensitive • Forward or Backward • Header/Footer/Footnote • Skip • Replace

- Replace All • Search for Style • Search by Attribute • Wildcards

Section Outline Numbering

- 6 Levels • Number Paragraphs • Numbered Lists • User-Defined Reset

Snaking Columns

- Up to 8 Columns • Column Balancing • On Screen • Variable Width • Variable Spaced

Sort

- Alphabetic • Numeric • Ascending • Descending • By Paragraph • By Word • By Number of Lines • 3 Levels—3 Words Within each Level

Spelling Check

- 130,000 Word Dictionary • Add to Dictionary • Correct Multiple Occurrences • Entire Document • Selected Text • International Dictionaries • Rest of Document • Skip All Occurrences • Statistics Report • Unlimited User Dictionary Size

Status Line

- Column Number • Document Name • Insert/Typeover • Line Number • Page Number

Style Sheets

- 27 Professionally Designed • Control All Formatting in Document • Document-Only Styles • Global Styles

Tables

- Up to 256 Columns • Column Width Control • Row Height Control • Auto Row Height • Lines around Cells • Shaded Cells • Connected Cells • Formulas: Four-Function Math, Sum Function, Absolute/Relative Cell Address • Insert Rows and Columns • Numeric Alignment and Formatting

Table of Contents

- 3 Levels • Separator Choice

Tabs

- Center • Leader Dot • Left • Numeric • Right

Text Enhancements

- Bold • Double Underline • Initial Caps • Italic • Lowercase • Overstrike • Small Caps • Subscript • Superscript • Underline • Uppercase • Word Underline

Thesaurus

- 1.4 Million Alternatives • Definitions • Gives Inflections • Synonyms

Undo

- Four-Level • Customizable

Unlimited Document Size

Vertical Centering

Widow/Orphan Control

Word Count

Upgrade now for \$129⁰⁰

Call 1-800-831-9679

The easiest to use just became
the easiest to buy.

With all these advanced features, you couldn't ask for a more powerful or easier to use word processor than Ami Pro. Now, for a limited time,* you can get it all for an easy to like price.

If you're currently using WordPerfect, Microsoft Word, DisplayWrite, Multimate, WordStar Professional or 2000, OfficeWriter, Samna Word IV or Lotus Manuscript, call our toll free number to find out how to upgrade by exchanging your cover page or program disk for a copy of Ami Pro at \$129.00. It's just that easy.

Ami Pro™ for Windows™
from
Lotus®

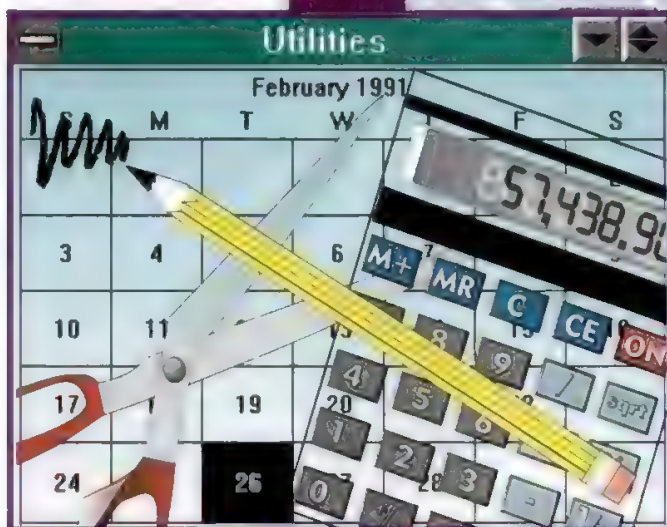
Lotus Word Processing Division, 5600 Glenridge Drive
Atlanta, GA 30342, 800-831-9679, 404-851-0007

CIRCLE 143 ON READER SERVICE CARD

*offer expires April 15, 1991. InfoWorld's Buyers Assurance Seal awarded August 13, 1990 to Ami Pro 1.2.

© 1991 Lotus Development Corporation. All rights reserved. Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. Ami Pro is a trademark of Samna Corporation, wholly owned subsidiary of Lotus Development Corporation. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. All other trademarks are the property of their respective holders.

Windows
Your Way:



41 Utilities For Windows 3.0

by Tom Unger

PC Magazine reviews over 40 utilities that make *Windows* more versatile, more productive, and quite simply, more useful.

Microsoft Windows 3.0 has cured most of the ills of its older versions, but its revamped interface isn't everyone's cup of tea and its built-in accessories are still so basic that you'd never dream of throwing away your steel rolodex. While the advantages of the *Windows 3.0* environment may tempt you to abandon the DOS prompt entirely, you may pine for the utilities you left behind.

Fortunately, the software markets and the bulletin boards are now teeming with *Windows* utilities. In the following pages you'll find over 40 programs for just about every task and taste: program and file managers, screen blankers, calendars, dialers, mouse enhancers, network and macro utilities, text editors, icon editors, and more. Some of them are such good replacements that they make the *Windows* desktop accessories look like toys from the Stone Age. Others are enhancements



that extend *Windows* in ways you might never expect.

THE SHAREWARE CONNECTION

One thing you will notice is that, in this arena at least, commercial software vendors don't have a monopoly on the best programs. As in the world of DOS utilities, shareware and public domain programs offer innovative and useful alterna-

tives at dramatically lower prices.

If you like icons but hate the ubiquitous *Windows* Program Manager, for instance, you might spring for *Pubtech File Organizer's* slick icon-oriented desktop; but you'll also find an able shareware alternative in *Aporia*. Likewise, if you're looking for a replacement calendar, you might prefer the snappy, powerful model that comes with *DeskTop Set*, but Impact Software's shareware *Almanac* is also worth a look. Take some time to scout the



EDITORS' CHOICE

- METZ Task Manager
- Pubtech File Organizer
- DeskTop Set
- WideAngle
- Bridge Tool Kit
- Windows Workstation

Of all the *Microsoft Windows* utilities reviewed here, six stand out as programs that are worth looking into for any *Windows* user.

For both program and file management, *PubTech File Organizer* (\$149.95) best deserves our Editors' Choice. The only product to implement successfully the idea of integrated, object-oriented file and program management in the *Windows* environment, it is clearly the place to go if you favor icons and are dissatisfied with *Windows 3.0's* two-part design.

A survey of the other program managers shows a number of alternatives but few unalloyed improvements. *Aporia* deserves an honorable mention for its interesting icon-based metaphor, but its unusual design isn't for everyone. The same is true of *Command Post*, which is extraordinarily useful if you appreciate batch files and menus, but less than inspiring if you don't. Despite the manifest deficiencies of the *Windows* File Manager, which is outstripped in speed and convenience by a host of DOS utilities, we're still waiting for the definitive third-party replacement.

One smaller utility does win top honors, however. Though not a full-fledged shell, *METZ Task Manager* is a real improvement over the Task List it replaces. With its complete set of window customization commands, simple but useful program launching and file-finding facilities, and an

animated screen saver, it goes far beyond the call of duty, and at only \$30 for the shareware version, it's a real bargain.

ACCESSORIES, MACROS, AND MORE

In the accessories department, *DeskTop Set* is the one to choose. Replacing *Windows'* feeble desk accessories with a powerful and well-integrated address book, dialer, phone log, and calendar combination rounded out with a full-featured tape calculator and a well-designed file viewer, the improved version of this \$149 product rivals many personal information managers in scope and capability. If you really plan to rely on these accessories, you can't do better than this.

Once all these applications and utilities start multiplying, even the largest monitor starts running out of screen real estate. *WideAngle* is the most ingenious solution we've seen to solve this problem. It expands your *Windows* desktop into nine separate full-screen regions, each accessible immediately through an ingenious keypad icon. If you're tired of wading through a dense thicket of windows on your desktop, *WideAngle's* \$129 price is worth paying.

Macro utilities automate your work, but not all of them work well. The most powerful and versatile of this group is *Bridge Tool Kit* from Softbridge. With full menu-building facilities and a comprehensive set of

programming statements, *Bridge* can automate just about any procedure, even those that involve both DOS and *Windows* applications, using custom menus and dialog boxes. At \$695 (which buys you three licenses), the full tool kit is very expensive but worthwhile if you need to get the job done. And if you don't need all its capabilities, the single workstation version, *Bridge Batch*, is an excellent deal at \$179.

Not all *Windows* users are networked, but those that are won't want to be without *Windows Workstation*. Depending on the importance of consistency, you may not need the centrally maintainable network menu system, but you'll find its excellent network print manager almost indispensable if you make regular use of shared network printers. The intercom and screen saver features are also very useful, and its batch language makes it possible to standardize procedures with ease.

A last honorable mention goes to hDC's *FirstApps*, a series of small utilities tied together by an extensible MicroApps manager that is always available on your current window. Most of its utilities are merely interesting, but a few very useful ones are to be found, notably Work Sets, which lets you save the positions and current files of several windows for later recall. File management and icon-editing applications were on the way at the time of this review.

halls of public bulletin boards, particularly the MSWIN forum on CompuServe, and you'll find lots of useful *Windows* software that you can download and try for yourself.

To help you make fast work of locating the product you need, we have divided this article into several sections, each reviewing related products:

- The sections on **Program Managers** and **File Managers** encompass replacements for the two *Windows* 3.0 shells, as well as ancillary file and program utilities like task lists and file searchers.

- The **Accessories** section includes replacements and enhancements for *Windows* accessories: dialers, calendars, address books, and calculators, as well as system configuration and memory analysis utilities.

- The **Screen and Mouse Enhancers** section includes utilities to expand your desktop and tweak your mouse, as well as a variety of animated screen blankers.

- The **Macro Utilities** section ranges from macro recorders that replace the *Windows* Recorder accessory to full-fledged batch programming languages.

- The **Text Editors** section offers some more-powerful alternatives to the feeble *Windows* Notepad.

- The **Icon Editors** section covers programs that give you the ability to edit icons for your *Windows* programs and to create your own.

- Finally, in the **Network Utilities** section you'll find *Windows* programs that perform the functions of the user and supervisor utilities of your network operating system.

Note that some utilities fall into well-defined categories of their own and therefore aren't included in this roundup: these include personal information managers such as *AllWin*, *YourWay*, and *PackRat*, font managers such as *Adobe Type Manager* and *SuperPrint*, fax utilities such as *WinFax*, and graphics utilities such as *Tiffany Plus* and *DoDot*. Look for reviews of these types of *Windows* programs in subsequent issues.

The great thing about *Windows* is its flexibility: If you don't like something,

you can replace it easily while remaining fully confident that it will work well with other *Windows* applications. Where *Windows* lets you down, these utilities take over. It would be surprising if you don't find at least one that you'll wonder how you lived without.

PROGRAM MANAGEMENT UTILITIES

by Paul Murphy

Although the Program Manager gives *Windows* 3.0 an attractive new face, there will always be those for whom it just isn't the answer. Some people don't like icons; others want their icons to be more powerful. Regardless of your opinion, there are plenty of commercial and shareware alternatives to the Program Manager. You can load another program as your so-called primary shell (the door you use to exit from *Windows*) by typing its name on the SHELL= line in your SYSTEM.INI file. Though Program Manager is the

default, the *Windows* police aren't going to arrest you if you decide to hang your hat on a different shell.

Whether you choose Program Manager, File Manager, or one of the other program managers we look at here, it should fulfill its role, which is to start all of your programs in the easiest and most-efficient manner while remaining flexible and customizable enough to meet your working requirements. Most of the program managers and launchers we look at here take different approaches to the organization, display, and execution of programs, and all attempt to make your personal *Windows* desktop more productive. That's what working in *Windows* is all about.



NEWTTOOLS INC.
Aporia

Aporia is perhaps the antithesis of the MS-DOS Executive. If you hate icons, you'll probably hate *Aporia*. But if the idea of a true iconic interface appeals to you, *Aporia* makes a superb (and, at \$50 for the shareware version, inexpensive) *Windows* shell.

Aporia starts out with existing Program Manager groups, creating an icon to represent each group (Desk Tools, in *Aporia* vernacular) and placing them right on your *Windows* desktop. Each Desk Tool contains the icons for the programs in that group; double-click on the Desk Tool and the program icons that belong to the group appear on your desktop. In order to run a program, you simply double-click on its icon or program tool. You can perform most other operations by clicking and dragging.

Aporia also has an assortment of other easy-to-use tools that help you manage and customize your desktop. The Trash Tool, for instance, serves as a garbage can for deleting other tools or files, similar to the Macintosh Trash Can icon. Like every other tool on the *Aporia* desktop, the Trash Tool has a hot zone that can interact with other tools, so if you drag a text-file tool on top of the Trash Tool, *Aporia* will ask if it should delete that icon and its associated file. All such "trashed" files are actually copied to a trash directory for safekeeping; when you're ready, you can remove them from the disk using the Trash Management option. This is a lot easier than cleaning your directory by going into DOS or using the File Manager.

OUR CONTRIBUTORS

Laura Cox is a labs assistant in the graphics group at PC Magazine.

Harry Geist is a technical support manager for marketing operations at The Equitable insurance company in New York City.

Ronni Geist is the president of Geistwriters Ltd., a Nyack, New York based company specializing in editorial and desktop publishing services.

Rock Miller is the associate editor responsible for graphics coverage at PC Magazine.

Paul Murphy is a member of Singer Murphy Associates, a New Jersey land-surveying firm, and a sysop on PC MagNet.

Barry Simon is a professor at the California Institute of Technology and a contributing editor of PC Magazine.

M. David Stone is a contributing editor of PC Magazine.

Tom Unger is a staff editor of PC Magazine.

ICONS ALL OVER

Other tools allow you to customize your desktop even further. For example, by dragging any program tool onto the Options Tool, you can change it from one of *Aporia*'s default icons to an icon of your choice. All *Aporia* icons are in a proprietary format with an .AIF extension, but you can convert any *Windows* icon (.ICO



users—with not an icon in sight.

Since *PC Magazine* last looked at *Command Post* ("Command Post Takes Tedium out of Windows with User-Defined Menus," October 11, 1988), much has happened to *Windows*, especially with the introduction of the Multiple Docu-

back. *Command Post* displays the contents of directories much like the old MS-DOS Executive, but it can also display a directory tree of one or more drives, which you can use to change the current directory listing. You can run programs by choosing them from the menus that you have built or by double-clicking on their filename, though the latter method will take multiple mouse clicks to change directories, scroll the display, and double-click the filename.

FILE MANAGEMENT

Menu choices simplify many file-management chores, however, including copying, deleting, and renaming files and directories. Window management functions tile, cascade, and arrange open windows with a menu selection; a built-in screen saver protects your monitor. A file-browsing utility called *Browser* is included with *Command Post* and can be started through a predefined menu choice. *Browser* can view any file and search for text, as well as show the hexadecimal format.

Command Post's design isn't for everyone, but for those who are most comfortable with the character-based world of file listings and batch languages, it's the perfect compromise, and its programmability makes it exceptionally versatile.



METZ SOFTWARE METZ Desktop Manager

The three shell programs (*Desktop Manager*, *Task Manager*, and *Desktop Navigator*) offered by METZ software share many of the same modules and are



Aporia places Desk Tools representing programs and program groups directly on your *Windows* desktop. Its Tree Tool displays a directory tree structure; clicking on any directory produces a file list.

or .ICN) file using *Aporia*'s ImageMaker conversion utility.

Aporia is an impressive and complex program, and it may daunt the less intrepid *Windows* user. In particular, it becomes quite unwieldy if you have too many program groups with hundreds of programs. Opening more than one Desk Tool at once is also a recipe for confusion; the program tools tend to overlap each other, creating a cluttered desktop.

Still, with a little planning and periodic housecleaning, your *Aporia* desktop can remain quite ordered and manageable, and can be a real improvement over Program Manager's icon desktop. Best of all, it's cheap, though NewTools has announced plans to market an enhanced commercial version in the first quarter of 1991, and the price may go up then.

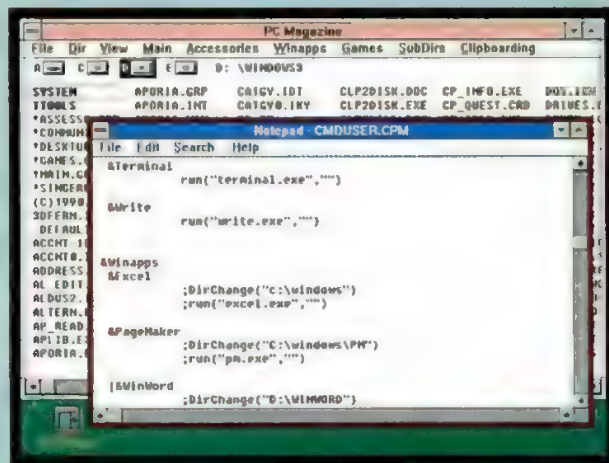


WILSON WINDOWWARE Command Post

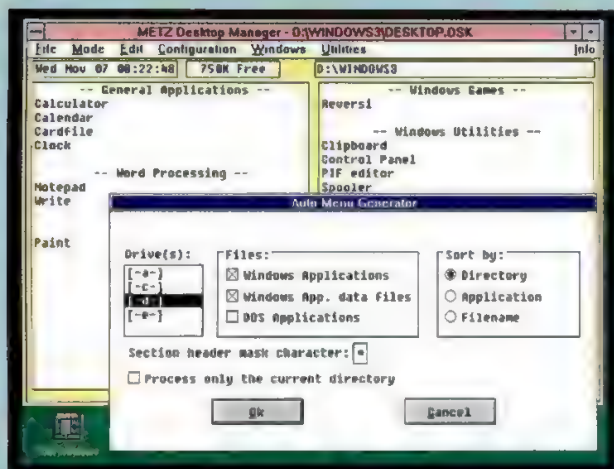
Command Post was originally conceived as an enhanced version of the MS-DOS Executive, and visually it carries that heritage into the *Windows* 3.0 era. Yet *Command Post* (\$49.95) offers such a great degree of utility that it remains a favorite of many long-time *Windows*

ment Interface. Yet *Command Post* flies in the face of these changes, maintaining its use of user-defined drop-down menus for the organization and execution of programs. In the current version, the batch language that controls the menus and their functions has been expanded to give you full control over how each menu selection will execute a program or do a complex task. You can even design your own dialog boxes.

Although advanced menu features may be the main attraction of *Command Post*, its variety of file and program management functions may keep you coming



Although its text-based menus make it seem old-fashioned, *Command Post* is a very powerful tool for customizing your desktop. Its menu language gives you almost 100 functions and control statements.



You choose programs in **METZ Desktop Manager** from a rather crude text list. You can add items to the menus manually or by using the **Auto Menu Generator** utility to scan your disks.

icons or other visual identification.

You can build menus manually using a standard set of cut-and-paste functions, but this can be a long, tedious process. It is possible to build submenus by creating separate menu files that can be linked, but this is inferior to the folder/document metaphor employed by hDC's *Windows Express*. As with the other METZ shells, you can also run programs from the built-in File Manager and File Finder, giving you a way to access files not listed on the menus.

On the positive side, *METZ Desktop Manager* comes equipped with a good range of support utilities, including the ability to password-protect menu items. But you should definitely avail yourself of the opportunity to try before you buy.

chock-full of features, including a screen saver and a file finder. Each takes a different approach to its user interface. In the case of *Task Manager*, the approach turns out terrific results, but the results from the lackluster *Desktop Manager* approach are unimpressive.

Desktop Manager (\$30) is primarily a menuing program that displays its menus on fixed list boxes. Although you can run programs by double-clicking on the ap-

propriate menu selection, it has no facility for assigning keyboard shortcuts. You can build menus automatically, but you can't use existing Program Manager groups to construct them; instead, the program must scan your hard disk for recognizable programs. The results are less than pleasing, since the entries are sorted alphabetically by filename or directory rather than in a useful order. The menu lists are text-only and contain no



METZ SOFTWARE METZ Task Manager

The Task List is one of the nifty items that *Windows 3.0* users soon discover in their new environment. Double-click on the desktop or press Ctrl-Esc, and you get a list box that lets you switch to any running program. Imagine, however, an enhanced Task List that does everything the Micro-



FACT FILE

Aporia

NewTools Inc., P.O. Box 3269, Church St. Station, New York, NY 10008; 800-395-1532, 718-789-5980.

List Price: \$50.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: A true icon-based interface for *Windows 3.0*, *Aporia* is a real improvement over *Windows 3.0*'s Program Manager.

CIRCLE 544 ON READER SERVICE CARD

METZ Desktop Manager

METZ Software, P.O. Box 6042, Bellevue, WA 98008-0042; 800-447-1712, 206-641-4525.

List Price: \$30.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: A menu program that displays options on fixed list boxes, this lackluster product is weak in capabilities and tedious to customize.

CIRCLE 546 ON READER SERVICE CARD

SmartWin

Romberg & Romberg, 6938 Briar Cove, Dallas, TX 75240; 214-934-2025.

List Price: \$59.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: Offering little improvement even over the MS-DOS Executive, this unimpressive shell is hard to recommend.

CIRCLE 548 ON READER SERVICE CARD

Command Post

Wilson WindowWare, 2701 California Ave. SW, #212, Seattle, WA 98116; 800-762-8383, 206-937-9335.

List Price: \$49.95.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: *Command Post* goes against the current in its reliance on batch procedures, text menus, and file listings, but it offers a degree of customization that is hard to match.

CIRCLE 545 ON READER SERVICE CARD



EDITORS' CHOICE

METZ Task Manager

METZ Software, P.O. Box 6042, Bellevue, WA 98008-0042; 800-447-1712, 206-641-4525.

List Price: \$30.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: One of the most practical enhancements you can buy for your *Windows* system, this simple but well-designed substitute for the *Windows* Task Manager offers a surprising degree of capability.

CIRCLE 547 ON READER SERVICE CARD

Windows Express

hDC Computer Corp., 6742 185th Ave. NE, Redmond, WA 98052; 206-885-5550.

List Price: \$99.95.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: *Windows Express* replaces your icons with a folder-and-document metaphor, and will appeal to you only if you prefer a structured approach.

CIRCLE 549 ON READER SERVICE CARD

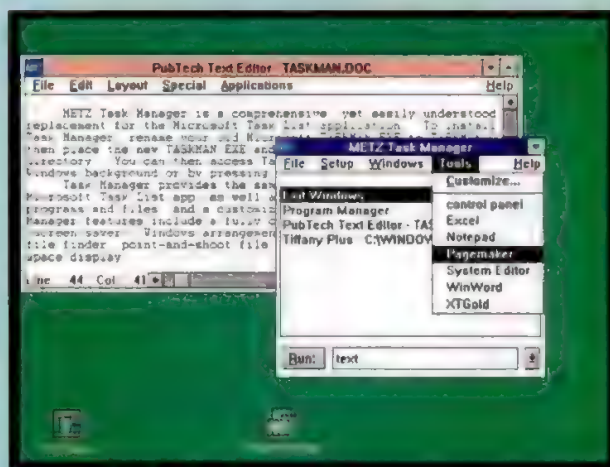


soft version does plus program and file management, and you'll have the *METZ Task Manager*.

METZ Task Manager replaces TASKMAN.EXE during installation, and you call it up the same way you call up the Windows Task List. The list of open applications is still visible, but the similarities stop there. A Tools menu lets you launch applications, which you assign to the menus using a simple file list box. You can also add programs to the Run box for easy access. The *Task Manager's* File menu contains a File Finder utility and a full-featured, yet simple, File Manager; each can be used to locate and run programs. *Task Manager* even has a detailed status indicator and an animated screen saver that can handle user-defined bitmaps. Amazingly, this small dynamo also includes the most complete set of window-customization commands found anywhere. It will cascade, tile, custom grid, iconize, or optimize your windows with incredible agility.

As this article was going to press, a commercial version of this product, *File F/X*, was offered by the ThreadZ Software Design Group of Redmond, Washington. At \$129.95 it is considerably more expensive than the shareware version, but *File F/X* includes a full-featured file manager, file find, text search, and undelete utilities, in addition to an enhanced *Task Manager*. The shareware version will still be available.

METZ Task Manager may start out as an unpretentious replacement for Windows' Task List, but you may find it is usable for your primary shell. It is one of the most practical enhancements you can buy for your Windows desktop; it's



Like the Task List it replaces, *METZ Task Manager* makes it easy to switch to running programs. But it also lets you launch programs quickly from its Tools menu, and to issue DOS commands directly.

cheap, it's shareware, and you shouldn't be without it.



ROMBERG & ROMBERG SmartWin

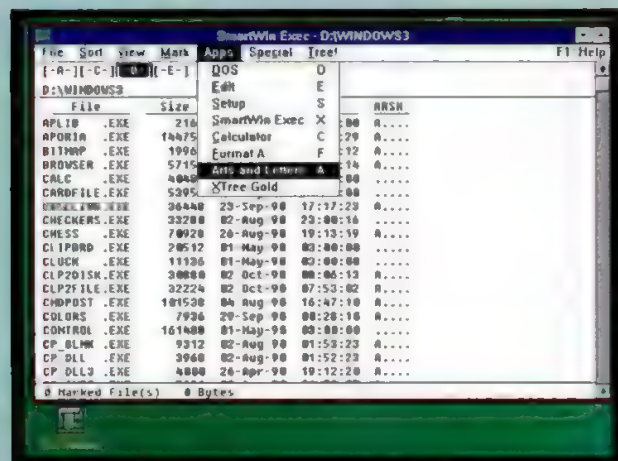
SmartWin provides few reasons to recommend it over any of the other program managers in this review. Although this \$59 shareware product has a good range of program and file management commands in its menus, it doesn't offer great customization facilities.

Though it has an Apps menu to which you can add programs, *SmartWin* is just an enhanced version of the MS-DOS Executive. It doesn't begin to approach the functionality of *Command Post*. Programs not on the Apps menu must be run by changing directories using a directory

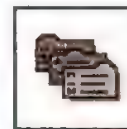
tree, or by clicking on the path as you would when using the MS-DOS Executive. *SmartWin* has no window-management functions, so you must use the Windows Task List or employ a supplementary program such as hDC's *First Apps* to cascade or tile your open windows.

One feature that *SmartWin* shares only with *Command Post* is its ability to direct the program's execution path with command-line parameters (which *SmartWin* calls macros). You can invoke macros manually, using the Run menu option, or by adding them to the Apps menu. But the documentation is hopelessly inadequate and only power users will be able to decipher how to use them.

An unimpressive tool stuck in the Windows 2.x era, *SmartWin* is more expensive and less powerful than *Command Post* and shouldn't be seriously considered.



SmartWin's Executive can start programs from its file list or from user-defined quick-start menus.



HDC COMPUTER CORP. Windows Express

The middle ground between the icon-driven *Aporia* and batch-driven *Command Post* belongs to hDC's *Windows Express* (\$99.95). This program is a slick and powerful manager that merges *Microsoft Windows 3.0's* capabilities with the familiar simplicity of a DOS menu program by using a metaphor of files and folders.

Like *Aporia*, *Windows Express* bases its organization on Program Manager's program groups, which appear as folders where program information and an image

When It Comes To Value and Support...

NOBODY BEATS SWAN.



"Swan managed to make and keep it's users happier than any other PC manufacturer."

PC Magazine Service & Reliability Issue 9/25/90



Now...Two years of FREE onsite service from TRW

Now...Swan systems prices reduced...up to \$1350!

Now...Technical support open every day with dedicated toll-free number

Call...for immediate shipment of popular configurations

"I wave the Swan flag... these people are great when it comes to making things work for the customer."

Daniel Morgan, PC Magazine, 9/25/90

"Swan computers... come with some of the fanciest support in the mail-order industry."

PC Sources, Nov. 1990

"The motto at Swan seems to be if it is broke, do fix it. Fast. And with courtesy."

PC Magazine 9/25/90

1-800-468-9044

ANY QUESTIONS?
CALL US TOLL FREE!

Now Featuring

Now You Can Experience 486 Performance For Only

\$3995

Complete 100MB
Monochrome system

486/25	VIDEO OPTIONS Include Monitor & Video Adapter			
	Drive Options	Mono	14" Flat Mono	VGA Mono 1024 VGA
w/100MB (17ms) IDE		\$3995	\$4045	\$4195 \$4395
w/200MB (16ms) IDE		\$4495	\$4545	\$4695 \$4895
w/330MB (16.5ms) SCSI		\$5095	\$5145	\$5295 \$5495
w/660MB (16.5ms) SCSI		\$5995	\$6045	\$6195 \$6395

Swan 486/25 Standard Features

New 2-Year OnSite Warranty

Onsite service is now included FREE for a full TWO YEARS—provided by TRW, a leader in field service

4MB Standard

Take advantage of environments like Windows 3.0

Dual Floppy Drives

1.2MB 5.25" and 1.44MB 3.5" standard

MS-DOS

You get a free copy of DOS already installed for you

VGA Card

If you choose a VGA configuration, you get the Swan Super VGA 1024 card, which supports both interlaced or non-interlaced 1024 x 768 resolution

High Capacity Hard Drives

Hard drive options include fast, high capacity IDE and SCSI drives from Hewlett Packard, Quantum & Conner

"Swan's 486/25... a great machine at a near mythical price. If someone offers a similar configuration for less, worry about the quality."

— Computer Shopper, October 1990

Prices Reduced On Swan Cache Systems

Swan 386/25C

Complete 100MB
VGA color system

\$2995

- 2 year onsite service
- 64K of SRAM cache
- 4MB of 32-bit RAM
- 100MB 17ms IDE drive
- High resolution color VGA (1024 x 768)
- Dual high-density floppy drives
- 1 parallel, 2 serial ports
- DOS 4.01 installed
- Utilities software

Many other configurations
available—call for details

Swan 386/33

Complete 200MB
VGA color system

\$3595

- 2 year onsite service
- 64K of SRAM cache
- 4MB of 32-bit RAM
- 200MB 16ms IDE drive
- High resolution color VGA (1024 x 768)
- Dual high-density floppy drives
- 1 parallel, 2 serial ports
- DOS 4.01 installed
- Utilities software

Many other configurations
available—call for details



PC
MAGAZINE

"Swan's engineers clearly demonstrated that the time of building PC's with whatever parts are cheapest is over."

—Bill Machrone,
PC Magazine, 9/11/90



photo includes Tower Case Option—\$250

PC
MAGAZINE

"The Swan 386/33... a strong recommendation as an ideal home or small office machine."

—PC Magazine, 12/25/90

S-B 2A4

Our Free 2 Year OnSite Warranty



Look At All You
Get For These
Incredible Prices:

Our Complete 386SX... \$1395

"It is well constructed, very expandable and one of the best 386SX performers we've seen...an excellent value."

— Computer Buyer's Guide & Handbook

386SX	VIDEO OPTIONS Include Monitor & Video Adapter			
	Mono	14" Flat Mono	VGA Mono	1024 VGA
w/50MB (17ms) IDE	\$1395	\$1445	\$1595	\$1795
w/100MB (17ms) IDE	\$1645	\$1695	\$1845	\$2045
w/200MB (16ms) IDE	\$2145	\$2195	\$2345	\$2545

Save With These SX Upgrades:

2MB Performance System

- 2MB RAM • 50MB, 17ms Hard Drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Logitech mouse • Swan mousepad

\$2149
you save \$80

4MB Power System

- 4MB RAM • 100MB, 17ms Hard Drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Logitech mouse • Swan mousepad

\$2549
you save \$120

- FREE two year on-site service **TRW**
- NEW 50MB hard drive with 17ms access time—features disk caching for even faster access!
- Small footprint baby AT case
- High resolution (720 x 348) mono monitor—Hercules compatible
- Top quality components
- MS-DOS®, OS/2®, UNIX® compatible
- 1MB of 80ns RAM
- Your choice: 1.2MB 5.25" or 1.44MB 3.5" floppy drive
- 1 parallel, 2 serial ports
- 7 expansion slots
- Enhanced 101-key keyboard
- Complete, highly-rated documentation

All Swan Systems

Now GSA Approved!

Contract# GS00K90AGS3325

S-B 2A4

Our Complete 386/25... \$1795

"It's faster than other uncooled machines tested... for the price, Swan's 386/25 offers some of the best performance you can buy."

— PC Sources, November 1990

386/25	VIDEO OPTIONS Include Monitor & Video Adapter			
	Mono	14" Flat Mono	VGA Mono	1024 VGA
w/50MB (17ms) IDE	\$1795	\$1845	\$1995	\$2195
w/100MB (17ms) IDE	\$2045	\$2095	\$2245	\$2445
w/200MB (16ms) IDE	\$2545	\$2595	\$2745	\$2945

386/25 Value Upgrades:

2MB Performance System

- 2MB RAM • 50MB, 17ms Hard Drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Logitech mouse • Swan mousepad

\$2499
you save \$130

4MB Power System

- 4MB RAM • 100MB, 17ms Hard Drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Logitech mouse • Swan mousepad

\$2899
you save \$170

Swan XT10



- 640K RAM standard
- Full range of video options
- On-site service available—\$59 for 1 year
- 8 expansion slots and 4 device bays
- Intel 8087-1 Math Coprocessor Socket

\$925

Complete system with 32MB drive, TTL mono

Swan 286/12

- All-in-one technology for superior reliability
- 7 expansion slots & 4 device bays
- Fast access IDE hard drives: 40MB to 80MB
- 512K RAM expandable to 8MB
- 200 Watt power supply

\$1045

Complete system with 40MB drive, TTL mono



Our Customer Assurance Program is Better Than Ever!

Superior Service and Support

The Swan Customer Assurance Plan is the best in the industry. And now, the best just got better with the addition of several exciting new support services! Before you buy your Swan, one of our knowledgeable, friendly sales consultants will help you select the right configuration for your needs and your budget.

NEW! 2 Year Warranty with FREE TRW OnSite Service

On all 286, 386 and 486 systems, your two year warranty includes free onsite service from TRW and free replacement of defective parts.



30-Day Money-Back Guarantee

If, for any reason, you're not satisfied with any Swan brand product, return it within 30 days for a refund.

NEW! Now Tech Support Is Open Every Day

Our award winning Technical Support is now available every day, 365 days a year.



NEW! Direct Access to Tech Support

Just call toll-free 800-468-7926 for direct connection to Swan's Tech Support Department. This assures you of quick response to your technical problems.

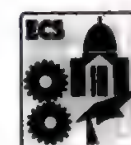
NEW! On-Line Shopping

The Swan OnLine bulletin board is being extended to include product information and order taking capability. Just call 814-237-6145 to join Swan OnLine and discover the convenience of on-line, 24 hour/day shopping.



NEW! Swan Computers Now On GSA Schedule

Government customers can call our government hotline 800-533-1131 toll-free for information on GSA approved pricing for Swan products.



Special Programs for Corporate & Education Customers

A special, dedicated sales team serves the unique needs of our growing base of corporate and education customers. Open accounts are available to qualified organizations.



Swan...A Brand You Can Trust



Monitors

Swan VGA 15

Our professional multiscanning monitor features non-interlaced 1024 x 768 resolution and a 15" anti-glare screen. It accepts both analog and digital input. Other features include .31mm dot pitch, auto screen sizing and tilt/swivel base.

\$599

Swan 1024

\$399

Video Cards

Swan Super 1024 VGA Card

Now non-interlaced! Treat your eye to the superior clarity and the fantastic colors of 1024 x 768 resolution. This card supports interlaced or non-interlaced graphics and 8514A emulation. Includes drivers for Windows and WordPerfect.

w/ 1MB **\$199**

w/ 512K **\$159**

w/ 256K **\$129**

Swan 8-bit VGA **\$119**

Swan Switchable **\$69**

CIRCLE 268 ON READER SERVICE CARD

Swan 9600 Baud Modem

This incredibly fast modem is ideal for high-volume, high-speed transmissions. Supports the v.42 standard for optimum error-free communication.

Internal **\$449**

External **\$Call**

2400 Bd MNP Int/Ext **\$149/\$179**

2400 Bd Int/Ext **\$79/\$129**

1200 Bd Int/Ext **\$69/\$89**

Tape Backups

Swan 500MB Tape Backup

Store up to 500MB on a DC600XL cartridge with data compression. Features include data security, backup logging and full Novell, 3COM, and PCNET compatibility.

Internal **\$829**

External **\$999**

Swan 250MB Tape Backup

This high-performance tape backup stores up to 250MB with data compression and features a 500KB/s data transfer rate. Supports the QIC-80 tape format.

Internal **\$319**

External **\$419**

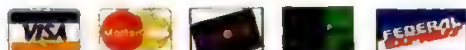
Swan 120MB Tape Backup

Features include data compression, error correction and multiple-language support.

Internal **\$249**

External **\$349**

Call Today For Your Free Swan Catalog



No surcharge on credit card orders. • Your card is not charged until your order is shipped. • Software or accessories orders over \$100 and under 6 lbs will be shipped Federal Express. • Orders for in-stock items received before 4 pm EST will be shipped same day...and each order is insured at no cost to you! • 3% or \$5 minimum for UPS Ground. Call for shipping charges on Express Air, APO, FPO, AK, HI and all foreign orders. • If part of your order is backordered, the remainder will be shipped UPS Ground. • Allow 2 weeks for all checks to clear. • ALL SALES (except Swan products) ARE FINAL. Items returned must be as-new, without modification or damage. All warranty cards, manuals, and packaging material must be included. Return shipping must be pre-paid and insured, bearing an RA* on the shipping label. • Shipping and upgrade fees are non-refundable. • Defective items replaced or repaired at our discretion. • PA deliveries add 6% sales tax. • Prices & terms subject to change without notice. • Products may differ from photos. • TRW service available for continental U.S., Puerto Rico and Hawaii—additional mileage charges may apply.

3075 Research Dr. • State College, PA 16801



S-B 2A4



ADDITIONAL PROGRAM MANAGEMENT UTILITIES

A number of other programs in this review have program management capabilities. A number of the file managers, for instance, can be used as program shells if you really prefer a file-based interface. But a couple of utilities deserve special mention here for the help they offer in taming your *Windows* desktop.

One of the most useful features of hDC's *FirstApps* (see the Accessories section) is its Work Sets, which allow you to run several programs simultaneously under a single name. You define Work Sets by setting up your desktop the way you want it, and then "saving" it in a work set, which retains the programs and the window arrangement. You can designate one work set to be run automatically at startup. The MicroApp Manager Menu attaches itself to the *Windows* Control menu, making it instantly available from any open application.

Similar in concept but far less powerful is *GESYS WindowsTools*, which is an array of small utilities that originated in Germany and are available on bulletin boards in this country. *GESYS WindowsTools* utilities are not quite fleshed out enough to be truly useful. For instance, its directory search utility doesn't display a directory tree and it cannot be used for switching to a directory. Its Program Starter is a bare-bones menu utility to which you must add program groups and applications manually through a dialog box that lacks any directory or search functions.

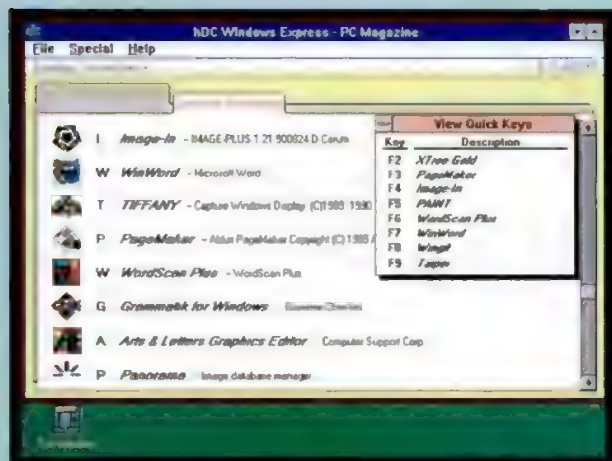
of the program's icon is placed. Unlike *Aporia*, however, the icons are for appearances only. You can start any program by pressing a single key or by clicking on its entry with the mouse. You can assign your most-used programs to so-called Quick keys (F1 through F9) that remain displayed in handy windows for easy reference.

FILES AND FOLDERS

You use the Express Editor to merge the Program Manager groups into *Windows Express*. Icons must be copied to *Express*'s proprietary format (they can also be pasted in .ICO or .ICN files). They can be edited, changed, or replaced with the program's built-in icon editor.

Adding new programs manually to the menus is a time-consuming process. You must first fill out a program information form (similar to but not as complex as a .PIF dialog box) for each program, and since the Express Editor does not have a browse facility like the Program Manager, you must know the full path and program name to complete the process. However, you can create entries simply by dragging the files from the *Windows* File Manager, which will give you a good head start.

Windows Express is much more than a menuing program, however. Because any menu entry can be password protected, *Windows Express* makes an excellent front-end for LAN administrators to use with *Windows* workstations. However, if your needs border more on the fundamental side and you have just a few *Windows* applications to manage, hDC's *Windows Express* can simplify your own *Windows* system as well.



Windows Express is similar to many DOS menu systems, but it uses a file-and-folder metaphor to help you find your programs quickly. You can start any program with a single mouse click, or by assigning a quick-start key.

EASY COME, EASY GO

For those who need a little help starting the program, there are four handy utilities to do the job well. Each is best when started from the Load= line of WIN.INI. *StraightLine*, a \$99 commercial product, remains on the desktop at all times; you bring it up by pressing a (user-defined) key or mouse-key combination. Its directory search functions make it easy to add programs to its Launch menu, and you can start programs that aren't on the menu using an Instant menu selection. You can also use it to switch tasks in the manner of the *Windows* Task List.

Launch, a free utility available on the MS-WIN forum, displays its menu when you point anywhere on the desktop and hold down the right mouse button. You drag your pointer to the desired program name and release the button to execute the program. You must add menu items manually, by editing a text file.

You can think of *METZ Runner* (\$10 shareware) as a handy command line that can be kept active as an icon until you need it. To start a program, you simply enter its name in the box as you would at the DOS prompt with command-line parameters included. Unfortunately, *METZ Runner* can't iconize itself after it starts, so you must minimize it manually. *Runner*, a free utility, places any number of *Runner* icons on the *Windows* desktop, representing programs that you have defined on its setup menu. You can then run these programs by clicking on the icon.

You may have an occasional need to exit to DOS quickly. There's no easier way to do it than with a free utility called *WinExit*. A *WinExit* icon can be placed on your *Windows* desktop or within Program Manager groups. In either case, double-clicking on the icon puts you right out to the DOS prompt without a confirmation box (the utility always checks open *Windows* applications for unsaved documents before closing them, of course).

StraightLine

First Genesis Software Inc., 1000 Sheland Pkwy., #270, Minneapolis, MN 55426; 800-325-6582, 612-544-4445.
List Price: \$99.

CIRCLE 550 ON READER SERVICE CARD

METZ Runner

METZ Software, P.O. Box 6042, Bellevue, WA 98008-0042; 800-447-1712, 206-641-4525.
List Price: \$10.

CIRCLE 551 ON READER SERVICE CARD



WINDOWS 3.0 UTILITIES AT A GLANCE

Products listed in alphabetical order within each section

This table uses distinctive tints to help you match *Windows* utilities with their core functions.

	PROGRAM MANAGEMENT UTILITIES						FILE MANAGEMENT UTILITIES				ACCESSORIES	
	Aporia	Command Post	METZ Desktop Manager	METZ Task Manager	SmartWin	Windows Express	Becker Tools	Dreagnet	Prompt	Pubtech File Organizer	Almanac	DeskTop Set
List price	\$50.00	\$49.95	\$30.00	\$30.00	\$59.00	\$99.95	\$79.95	\$144.95	\$129.95	\$199.95	\$59.95	\$149.00
PROGRAM MANAGEMENT												
Runs programs from program icons	☒	☐	☐	☐	☒	☒	☐	☐	☐	☒	☐	☐
Runs programs from menus	☐	☒	☒	☐	☐	☐	☒	☐	☐	☒	☐	☐
Cascades and tiles windows	☐	☒	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐
Uses program groups or folders	☒	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐
Uses program sets	☒	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐
Task list	☐	☒	☒	☒	☐	☐	☐	☐	☐	☒	☐	☐
DIRECTORY MANAGEMENT												
Creates and removes directories	☒	☒	☐	☐	☒	☐	☒	☐	☒	☒	☐	☐
Moves directories	☐	☐	☐	☐	☐	☐	☒	☐	☒	☒	☐	☐
Directory tree	☐	☒	☒	☒	☒	☐	☒	☐	☒	☒	☐	☐
Prunes and Grafts branches	☐	☐	☐	☐	☐	☐	☒	☐	☒	☒	☐	☐
FILE MANAGEMENT												
Copies and moves files	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒	☐	☐
Deletes and renames files	☒	☒	☒	☒	☒	☐	☒	☐	☒	☒	☐	☐
Changes file attributes	☐	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐
Tags multiple files	☒	☒	☐	☐	☒	☐	☒	☒	☒	☒	☐	☐
Searches file contents	☐	☒	☒	☒	☒	☐	☒	☒	☒	☒	☐	☐
Compresses files	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐
Backs up files	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐
Encrypts and decrypts files	☐	☐	☐	☐	☐	☐	☒	☐	☒	☒	☐	☐
Formats floppy disks	☐	☒	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐
ACCESSORIES												
Address book	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒
Calendar	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Daily view	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Weekly view	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Monthly view	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Yearly view	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
To-do list	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Recurring tasks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Alarms	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Clock	☐	☒	☒	☐	☐	☐	☐	☐	☐	☐	☒	☒
Event timers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒
Phone dialer	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒
Timed dial	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒
Phone log	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒
Calculator	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒
SCREEN AND MOUSE ENHANCEMENT												
Assigns keystrokes to mouse buttons	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐
Screen blanker	☒	☒	☒	☒	☐	☒	☒	☐	☐	☒	☐	☐
Password protection	☐	☐	☒	☐	☐	☐	☒	☐	☐	☐	☐	☐
Expands desktop	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Editors' Choice

☒ Yes

☐ No

First Apps		WinSleuth *		SCREEN ENHANCER		MACRO UTILITIES			TEXT EDITORS		ICON EDITORS		NETWORK UTILITIES			
\$99.95	\$149.00			\$129.00		\$695.00	\$99.95	\$99.95		\$79.95	\$295.00		\$10.00	\$10.00		\$695.00

*WinSlæuth is an accessory specializing in system analysis.

CONTINUES



WINDOWS 3.0 UTILITIES AT A GLANCE

Products listed in alphabetical order within each section

	PROGRAM MANAGEMENT UTILITIES						FILE MANAGEMENT UTILITIES				ACCESSORIES	
	Aports	Command Post	MIETZ Desktop Manager	MIETZ Task Manager	SmartWin	Windows Express	Becker Tools	Dragnet	Prompt	Pubtech File Organizer	Almanac	DeskTop Set
MACROS												
Assigns hotkeys to applications	☐	☒	☐	☐	☒	☐	☐	☐	☐	☒	☐	☐
Keystroke macros	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Uses batch or macro language	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Macro editor	☐	☒	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐
Conditional branching	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Customizable dialog boxes	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Assigns icons to macros	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐
TEXT EDITING												
Text-file browser	☐	☒	☐	☐	☐	☐	☒	☒	☒	☐	☐	☐
Text editor	☐	☒	☐	☐	☐	☐	☒	☒	☐	☒	☐	☐
Multiple documents	☐	☐	☐	☐	☐	☐	☐	☒	☐	☒	☐	☐
Search-and-replace	☐	☒	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐
Undo	☐	☒	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐
Merge files	☐	☒	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐
Print files	☐	☒	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐
ICON EDITING												
Creates icons	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐
Extracts icons	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐
NETWORK FUNCTIONS												
Attaches and detaches servers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Connects and disconnects network drives	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Attaches and detaches network printers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Displays print queue	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Holds and releases jobs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cancels jobs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

☐—Editors' Choice

☒—Yes

☐—No

FILE MANAGEMENT UTILITIES

by Ronni Geist and Harry Geist

Microsoft Windows 3.0's File Manager is a big improvement over the old MS-DOS Executive. The new File Manager has a much prettier face, and it augments its core group of basic file operations with such useful basic abilities as moving files, associating data files with applications, using wildcards to search an entire disk for specific files, or changing file attributes. Working from a new, icon-based directory tree with folders that can be clicked

on to reveal subdirectories or files, many of File Manager's operations can be performed just by pointing and dragging file-names or icons around the screen. And File Manager's new network features make it easy to add and remove network drive mappings.

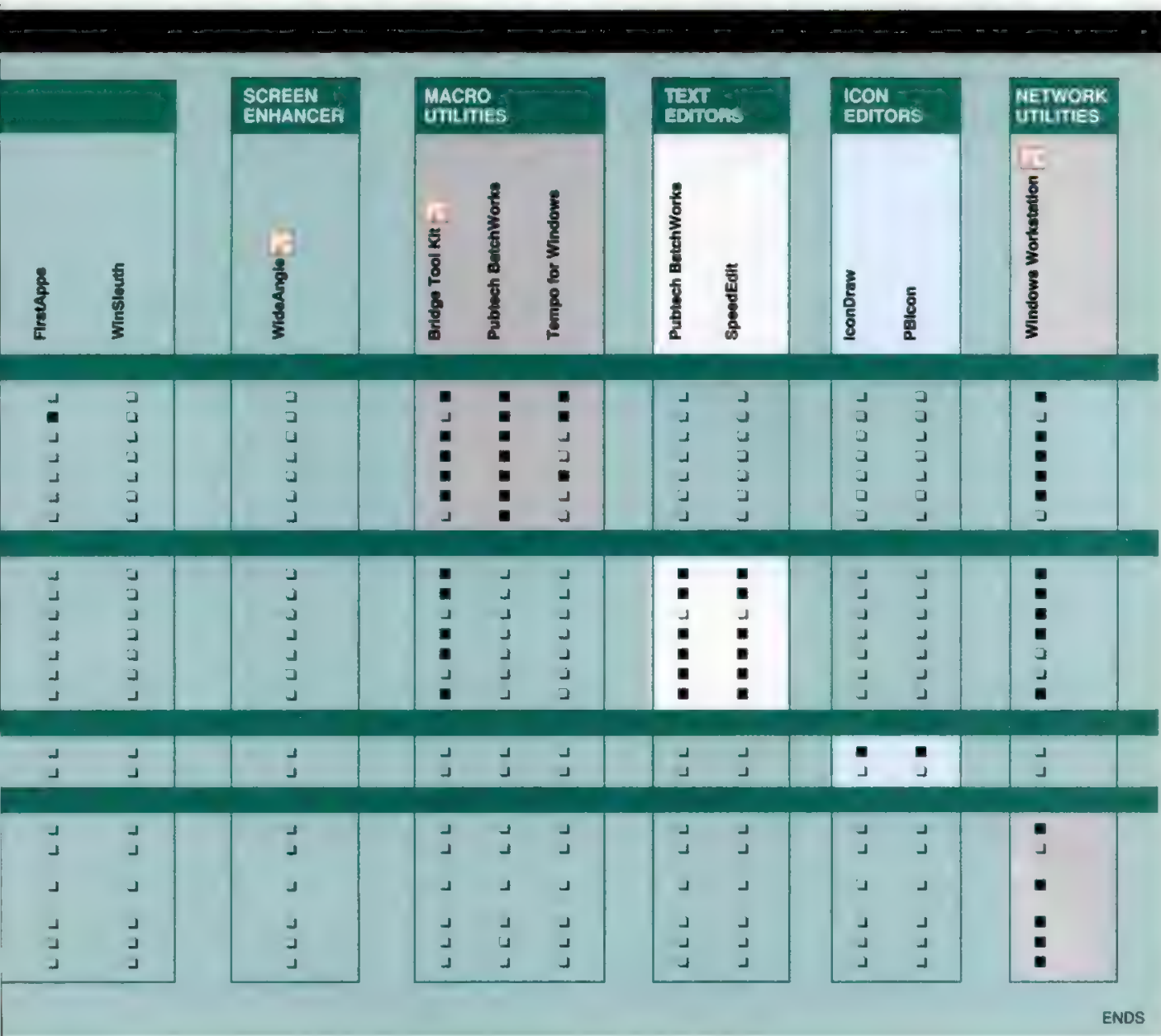
Still, the File Manager is far from perfect, and there's plenty of room for improvement in features and in function. The products reviewed here augment File Manager by adding features not otherwise available—encryption, compression, text search, and backup—and by replacing it with a new interface. You may find one that suits your needs better.



ABACUS Becker Tools

BeckerTools (\$79.95) is designed for those who prefer a text-based file manager rather than an icon-based one. Unfortunately, it's unattractive, and a flawed design makes it less than useful.

BeckerTools can be operated from pull-down menus or from the ToolBox, a set of pushbuttons that show up at the bottom of the screen. Despite these options, the program is intolerably rigid. For file operations, the screen is divided into a source window and a target window, and you must perform all operations using a series



ENDS

of pushbuttons and dialog boxes that must be selected in specific sequences. You can specify file and directory operations in only the source area, and the source and target locations must be specified before you can initiate any copy or move operations. Most operations are cumbersome and require more steps than they do in File Manager.

BeckerTools offers several capabilities not available in File Manager. You can search for text or a hexadecimal string within a file, directory, or a disk (though not across multiple volumes). You can also Undelete erased files, though the results can be unpredictable; in our expe-

rience, the undeleted file sometimes emerged larger than when it had gone in. Another potentially useful feature is the program's ability to compress files, but it uses a proprietary compression algorithm, so the recipient of the compressed file must have the *BeckerTools* software program in order to decompress it. The compression algorithm proved inefficient in comparison with PKZIP and other commonly available utilities.

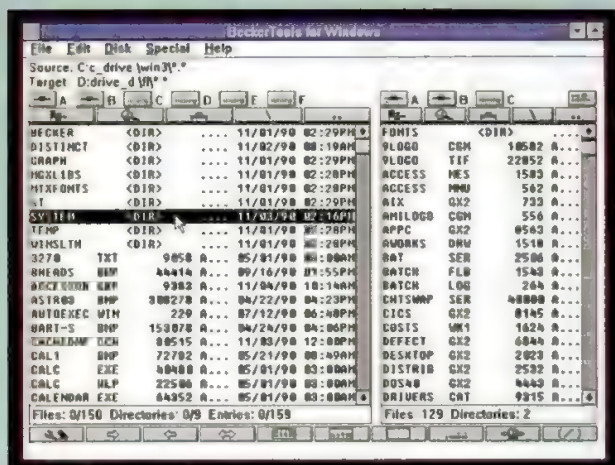
You cannot run a program from *BeckerTools*, and its file-management functions make it less than useful for that purpose as well. It's hard to recommend it for any purpose.



ACCESS SOFTEK Dragnet Prompt

Dragnet and *Prompt* are two programs that work best as a matched pair. *Prompt* (\$129.95) supplies an easy-to-use point-and-drag interface for copying and moving files and directories, while *Dragnet* (\$144.95) offers robust file-search capabilities.

Prompt's screen uses graphics to spell things out for you. Disk drives are represented by icons, which are proportionally filled in to represent the percentage of used capacity. An optional bar chart to the



BeckerTools' cluttered dual-screen display is awkward to use. Some functions can be activated through the pushbuttons at the bottom, but more basic operations such as copying and moving files are accessible only through the Toolbox icon at the lower left.

duty text search jobs, you can rely on *Dragnet*. *Dragnet* serves its singular purpose well. It can search in a single directory (including or excluding its subdirectories), over an entire hard disk, or across multiple hard disks.

Dragnet operates through a series of dialog boxes in which you specify the extent of the search and the text strings to search for. You can designate from one to six text strings, each having up to 80 characters, and these can be divided into two sets of three Boolean "ors" connected by an "and." Thus, for instance, you might ask *Dragnet* to find "(John or Tom or Martin) and (Smith or Wilson or Johnson)."

You can use question mark wildcards to represent individual characters, but the global wildcard (*) is not available. You can optionally choose a case-sensitive search, and you can specify whether the text string is a whole word or part of a word, and even the block size within which all of the strings must be located. If desired, you can specify that the search locate all files that do not contain the search criteria.

The results of *Dragnet's* search can be sent to the screen, to a file, or to the Windows clipboard. And when *Dragnet* is installed along with *Prompt*, it establishes a DDE link to mark the files it finds. This makes it easy to copy or delete a group of files in *Prompt* based on the results of a text search.

Prompt is a good choice if you do mass file operations, and in combination with *Dragnet* it makes a powerful tool for managing your text files.

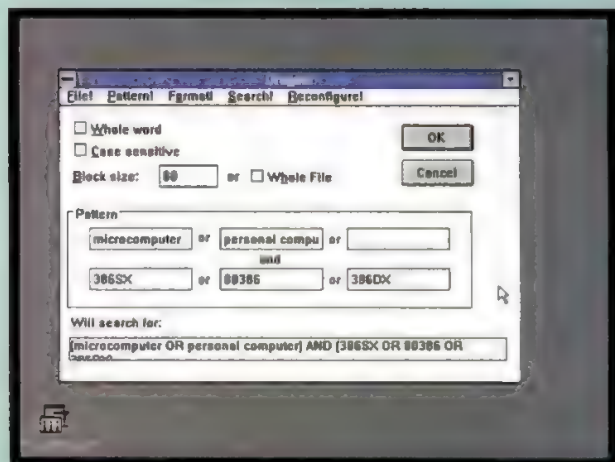
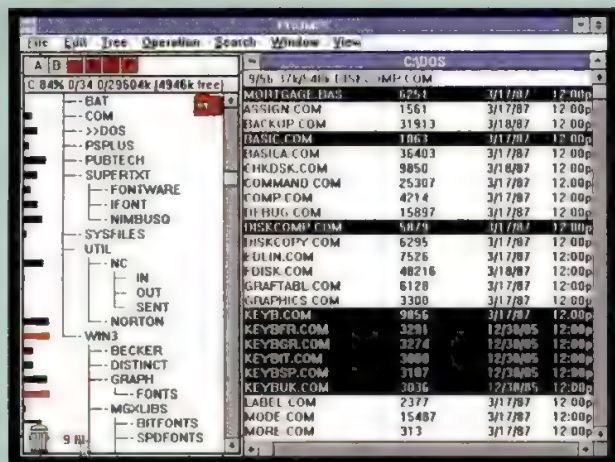
left of the directory tree indicates roughly the total size of the files in each directory. Creating a new directory is simply a matter of clicking on the folder icon, entering the directory name, and dragging the name to the appropriate location on the directory tree. It's easy to highlight groups of files (you don't have to hold the Shift key down). Deleting files or directories involves dragging the highlighted entries to a garbage can icon (though you can't empty the garbage can to retrieve or undelete files).

Prompt's intuitive design makes it easy to use, but its terminology can be confusing. The Edit menu contains options such as Cut, Copy, Paste, Clear, Drag Copy, and Drag Move, which ordinarily refer to text editing procedures. The options are

used here to represent pruning from and grafting to directory trees. The manual's index does not even mention the Edit menu (or any other menu item), and though pruning a limb from one directory and grafting onto another (even across drives) is a very easy process—once you understand it—the documentation that is included with *Prompt* does not explain this action. Similarly, the software cries out for a summary chart of mouse actions in conjunction with the Shift, Control, and Alt keys.

CASTING A NET

Prompt has a number of file viewers that let you look directly into *dBASE*, *Lotus 1-2-3*, *WordPerfect*, and other files, including some graphics files. But for heavy-



With its side-by-side directory tree and directory list windows, *Prompt* makes an excellent tool for mass file operations. The addition of *Dragnet* gives it powerful Boolean search capabilities.

Buy Ventura Software now and get an immediate return on investment.

\$75 REBATE



Now through April 15—earn a \$75 rebate on every Ventura Software product you buy.

Ventura Publisher. The more you have to do, the more you need it. Pick your platform: Windows 3.0, DOS/GEM, OS/2—or our new Macintosh Edition. Ventura is the powerful desktop publishing software that automates steps other programs make you repeat over and over. It makes short work of long documents.

FormBase 1.1. The easy-to-use Windows 3.0 database.

FormBase is the relational database that also generates forms. Create a form and FormBase automatically creates the database. Enter data once and FormBase shares it with other forms you've created. No programming needed.

FOR REBATE: Please enter your name and the product serial number. Mail with proof of purchase and original registration card to:
Ventura Software, P.O. Box 1462, Poway, CA 92074.

Name (Print)

Product Serial #

For product information, call (800) 822-8221 (US); (800) 228-8579 (Canada). Rebate may not be combined with upgrade or any other promotional offer. Only one rebate per package. Good only in US and Canada. Allow two to three weeks for processing. Offer begins 1/9/91 and expires 4/15/91. Coupons must be postmarked by 4/30/91.

Ventura Software Inc.
A Xerox Company

PCM91



PUBLISHING TECHNOLOGIES INC. Pubtech File Organizer

Pubtech File Organizer (\$199.95) dazzles the eye with a wide variety of colorful icons, not only for *Windows*-based appli-



FACT FILE

BeckerTools

Abacus, 5370 52nd St. SE, Grand Rapids, MI 49512; 800-451-4319, 616-698-0330.

List Price: \$79.95.

Requires: 1MB

RAM, hard disk,

EGA or VGA

graphics adapter,

Microsoft *Windows* 3.0, DOS 3.1 or later.

Mouse recommended.

In Short: Any benefit from this product's familiar dual-window interface is offset by awkward design and quirky features. It is not recommended.



CIRCLE 602 ON READER SERVICE CARD

Dragnet

Prompt

Access Softek, 3204

Adeine St.,

Berkeley, CA 94703;

415-654-0116.

List Price: *Dragnet*,

\$144.95; *Prompt*,

\$129.95.

Requires: 1MB

RAM, hard disk, EGA or VGA graphics

adapter, Microsoft *Windows* 3.0, DOS 3.1 or

later. Mouse recommended.

In Short: *Prompt's* natural click-and-drag interface, in combination with *Dragnet's* powerful Boolean searching capabilities, adds up to an excellent tool for text file management.



CIRCLE 603 ON READER SERVICE CARD

EDITORS' CHOICE

Pubtech File Organizer

Publishing Technologies Inc., 7719 Wood Hollow Dr., #260, Austin, TX 78731; 800-782-8324, 512-346-2835.

List Price: \$199.95.

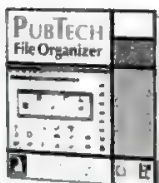
Requires: 1MB RAM,

hard disk, EGA or

VGA graphics adapter, Microsoft *Windows*

3.0, DOS 3.1 or later. Mouse recommended.

In Short: A vivid icon-based interface and easy object-oriented procedures make this attractive shell the best replacement for *Windows* 3.0's File Manager.



CIRCLE 604 ON READER SERVICE CARD



The *Pubtech File Organizer* offers a true icon-based desktop, assigning specialized icons for different file types (which can, in turn, be associated with applications). Note that it offers icons not only for hard disks and floppy disk drives, but for peripherals as well.

cations, but for all your various files—spreadsheets, text files, databases, executable, and so on. It also provides distinctive symbols for your hard disks, floppy disk drives, and printers.

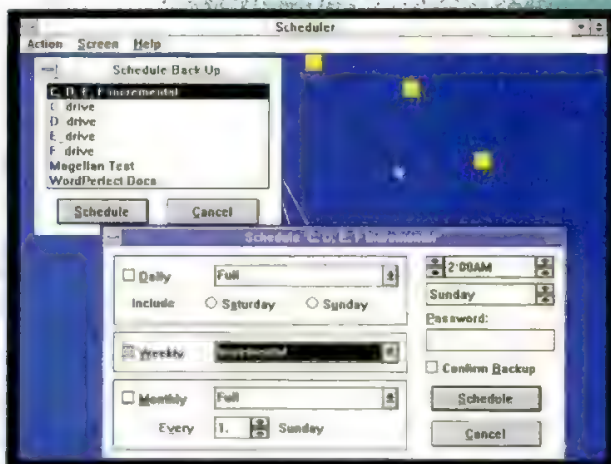
Pubtech File Organizer can be somewhat intimidating at first. You can easily end up with a multitude of icons on your screen and not know exactly how they got there—or how to remove them. But the software is easy to learn, and you'll soon become comfortable with it, especially when you realize how it makes performing file operations a breeze. You can move a file to an icon simply by dragging it to its new location, and print a text file by dragging its icon on top of the printer icon. If the target location for your operation is not available, you can even use the *Windows* desktop as a temporary hold location until you ready the appropriate destination volume or device.

REAL-WORLD OBJECTS

You'll see a single menu bar at the top of the screen, regardless of the current window. Each window represents a single disk drive and is filled with folders (representing directories). Windows can be opened concurrently, cascaded, or tiled on-screen. You can also display the overall tree structure of your hard disk, though you can't collapse the branches and expand them. You can prune and graft directories from this point or by pointing and dragging the folder icons with the mouse.

For deleting files, *File Organizer* has a garbage can that bulges when files have been put into it. It is easy to recover files from the can if you need to, but there's no true undelete function. You can search for text in files but only on a single disk at a time. Unfortunately, it lacks file viewers.

Although it can look somewhat complex at first, *Pubtech File Organizer's*



Distinct Backup offers a range of high-speed backup facilities for *Windows*, including a scheduler that lets you specify daily, weekly, or monthly project backups.

You'll Like What's Inside the CompuAdd 333T. *PC Magazine* Did!

- *PC Magazine* Editor's Choice (December 25, 1990)
- Finalist, *PC Magazine* Award for Technical Excellence, 1990
- CompuAdd's award-winning customer service



CompuAdd's Hot Slots Boost 333T Performance



33MHz 386 computers.

You'll see CompuAdd-exclusive "hot slots," two 16-bit expansion slots designed to maximize performance of the CompuAdd HardCache/ESDI controller card and the CompuAdd Hi-Rez VGA card. Each slot still works perfectly with a standard 16-bit expansion card, should you choose that option. And you'll see a motherboard designed by CompuAdd to take maximum advantage of the optional, ultra fast SRAM board.

Now, run the 333T. You'll see the speed that makes it the *fastest 33MHz 386 computer you can buy* — as measured by top scores on *seven of nine* PC Labs benchmarks, including the 386 Instruction Mix Text. In its review, *PC Magazine* said the CompuAdd 333T "scored the best time in the group, or close to it, on every test we put it through, boasting the best overall performance in the field."

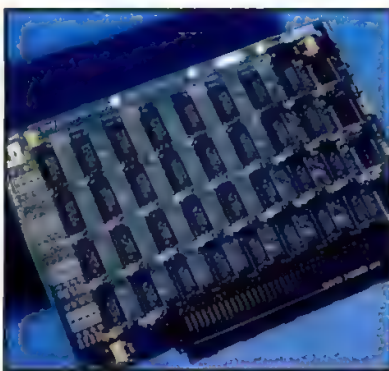
Look inside the CompuAdd 333T. You'll see what prompted *PC Magazine* to call it "a speed demon" and "a power user's dream machine" in its review of 45 leading

The CompuAdd 333T is the right choice when you need full-scale multitasking capabilities in either a reliable network file server and a powerful stand-alone workstation.

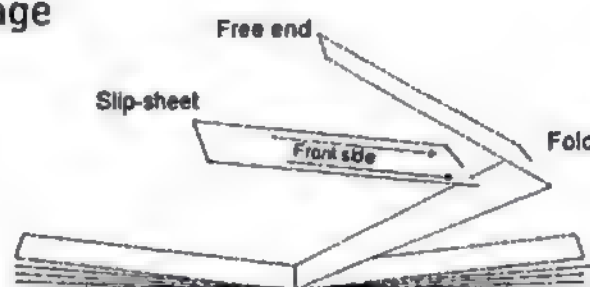
Compare the 333T. You'll see why *PC Magazine* praised its "top-notch expandability" and its "quality construction throughout" and why *PC Magazine* concluded that the 333T was the "best value in an intelligently designed PC."

You'll see that in value and performance, the competition can't touch the CompuAdd 333T. With the CompuAdd 333T at the heart of your network, you'll have the power, speed and expandability you need. Speed to keep your work flowing. Power to run today's — and tomorrow's — 32-bit software. Expandability to grow with your business. And the CompuAdd commitment to quality and service.

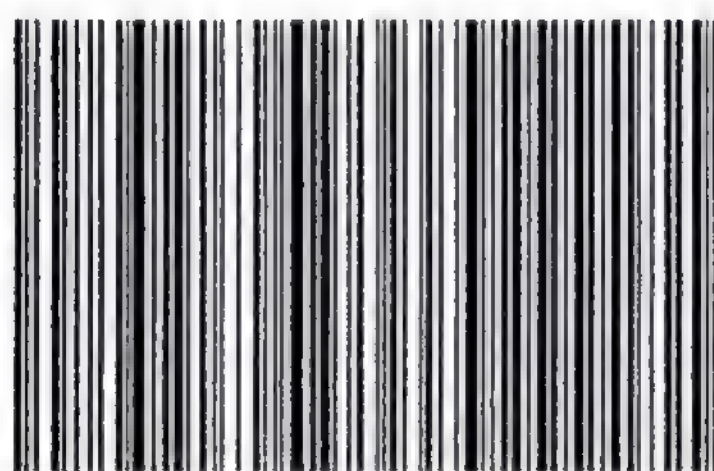
Call today for a CompuAdd value on the computer *PC Magazine* says "will be hard to beat at any reasonable price."



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



GbsSlipSheet-001

Inverted Foldout slip-sheet

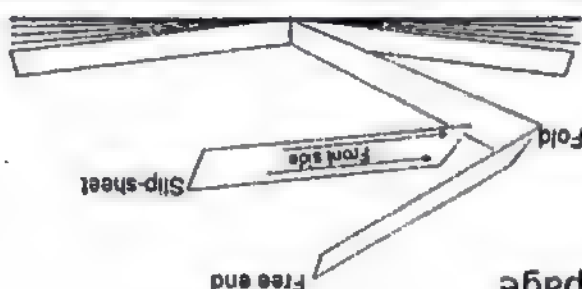
Folded edge of the page

1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page
2. Arrow pointing to the fold

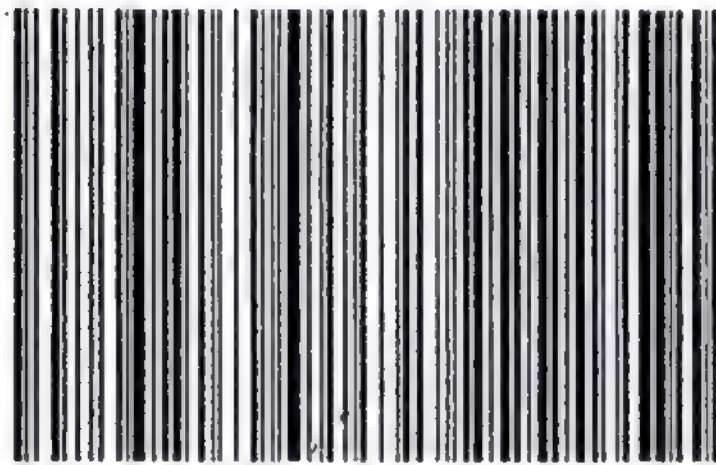
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side

COMPUADD 333T: BEST

Look Inside the "Power User's Dream Machine"

PC Magazine, December 25, 1990

\$2775



Five half-height internal drive bays

Parallel port and two serial ports built in to system board

CompuAdd-exclusive "hot slot" designed for maximum performance with the CompuAdd HardCache/ESDI controller

CompuAdd's exclusive "hot slot" designed for maximum performance with the CompuAdd HardCache/ESDI controller

Intel® 33MHz 386 microprocessor, Phoenix BIOS, 64KB cache, math coprocessor socket (supports Intel 80387 or Weitek 3167)

Four half-height front-access drive bays

Motherboard designed by CompuAdd engineers to stretch the 386 performance envelope with the optional high-speed SRAM card

Room for up to 16MB DRAM or memory

Windows 3.0, CompuAdd MS-DOS 4.01 and FREE Microsoft Working Models preloaded on hard drive models

CompuAdd 333T: Best Overall Performance

CompuAdd 333T

The 333T is a proven winner, picked as Editors' Choice in *PC Magazine*, December 25, 1990! And picked as a finalist for *PC Magazine's* 1990 PC Technical Excellence award! It's the *fastest 33MHz 386 system you can buy* — as determined by top scores on seven of nine PC Labs benchmarks. In selecting the 333T as Editors' Choice, the editors credited the CompuAdd 333T with "the best overall performance in the field."

CompuAdd 333 Full Profile

The CompuAdd 333 Full Profile desktop system has the exact same performance as the 333T. Only the case is slimmed down. The Full Profile model sports three half-height front access and two half-height internal 5.25" drive bays, six 16-bit and one 8-bit expansion slots. So you have plenty of room to add extra drives and option cards.



Whether you use it as a network server or as a powerful standalone workstation for CAD/CAM, database management, spreadsheet applications or desktop publishing, the CompuAdd 333T or 333 gives you the fastest 32-bit computing power you can get in a 33MHz 386 system!

CompuAdd Value

CompuAdd built its reputation on giving you high performance computers at unbeatable values! Don't

just take our word for it. The first Dataquest vendor-neutral survey of PC users asked people how satisfied they are with their PC purchases. *CompuAdd received the best endorsement any manufacturer could ask for* — CompuAdd ranked #1 for Value/Price, Quality, Commitment to the Customer and Overall Satisfaction!

Dataquest did not use vendor-supplied customer lists. The independent, statistically valid survey ranked 25 leading PC manufacturers, including IBM, Compaq, Apple and Hewlett-Packard. *The Score Report: Personal Computer Customer Satisfaction Survey* by Dataquest, a company of The Dun & Bradstreet Corporation.

Call today for more details on CompuAdd's award-winning products and service!

CompuAdd 333T and 333FP Features

- 80386 microprocessor running at 33MHz
- 4MB DRAM expandable to 16MB
- 0 wait-state cache memory
- High-speed cache memory controller with 64KB SRAM cache
- 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- Dual diskette controller
- Six 16-bit and one 8-bit expansion slots
- Four half-height front access and five half-height internal 5.25" drive bays (Full Profile has three half-height front access and two half-height internal 5.25" drive bays)
- One built-in parallel and two serial ports
- 80387 or Weitek 3167 math coprocessor socket
- FREE CompuAdd serial mouse \$24.95 value
- FREE CompuAdd Windows 3.0 \$149 value
- FREE Microsoft Working Models
- FREE CompuAdd MS-DOS 4.01 \$89 value

CompuAdd 333T base system

\$2775 - 66656

CompuAdd 333 Full Profile base system \$2595 - 66665

Enhanced 333 systems upgrade base system features with: 150MB ESDI drive, CompuAdd HardCache/ESDI controller with 1MB RAM, Seiko 14" CVGA monitor, CompuAdd Hi-Rez VGA card with 512KB RAM and 640KB SRAM card.

CompuAdd Enhanced 333 Full Profile \$5775 - 66669

CompuAdd Enhanced 333T \$5975 - 66660

333 Monitor and Hard Drive Options

	MGA	CVGA
333T 80MB	66658 - \$3575	66659 - \$4175
333T 200MB	66661 - \$3975	66662 - \$4575
333 80MB	66667 - \$3395	66668 - \$3995
333 200MB	66670 - \$3775	66671 - \$4395

CompuAdd®

Customer driven, by design.™

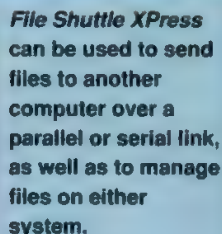


Call 800-456-3660

Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST

12303 Technology, Austin, Texas 78727



SPECIAL-PURPOSE FILE UTILITIES

For high-speed file transfer between computers, *File Shuttle XPress* (\$139.95) steps into the niche filled by *LapLink* and *The Brooklyn Bridge* on DOS systems. The latest version includes *Windows* and DOS versions that let you interconnect both types of machines. Aside from running under *Windows*, *File Shuttle XPress* is fairly typical of the genre, though its documentation could be better. It offers serial and parallel transfers (the latter over

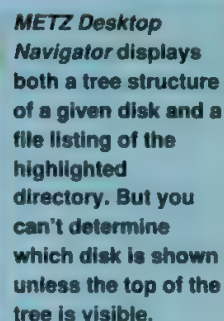
Finally, if you maintain large archives of compressed files, take a look at *Zip Manager* (\$21.95). This Windows-based program acts as a central command station for creating and extracting compressed file archives. Though it's designed for use with PkWare's PKZIP, it also works with the popular file compression utilities ARC and LHARC (the latter for

CIRCLE 605 ON READER SERVICE CARD

CIRCLE 606 ON READER SERVICE CARD

CIRCLE 607 ON READER SERVICE CARD

Three other *Windows* file management programs deserve mention. *METZ Desktop Navigator* was in the final stages of testing at the time of our review and should be available in final form by the time you read this. As a shareware program, it offers a customizable drop-down menu for running programs, a password-protected screen saver, and a full range of file management utilities, including the ability to search for files over multiple disk



drives in one pass. Though it's not icon-based, it's useful as a basic file manager.

WinNav, from FlashPoint Development, is considerably more ambitious. Intended to be the *Windows* equivalent of *Lotus Magellan*, this program searches files locally and globally, archives and unarchives using several standard file-compression utilities, scans for viruses, and launches programs. Currently it is in "developware" stage; a test version is available for \$45 for those who want to try it out, but the product is still in a state of evolution. If you're curious, though, it's worth a look.

Finally, just announced at the time of our review was *FileApps* from hDC Computer Corp. These five pop-up "MicroApps," which work in conjunction with the MicroApp Manager in hDC's *FirstApps*, let you view disk space graphically, undelete, encrypt or search within files on your disk, and transfer files from computer to computer.

WinNav

FlashPoint Development, P.O. Box 270492; Houston, TX 77277; 713-660-7240.

List Price: \$45.

CIRCLE 608 ON READER SERVICE CARD

ACCESSORIES

by Tom Unger

Unlike accessories for your car (remember that titanium-alloy windshield scraper that doubled as an FM radio signal enhancer?), the accessories you purchase for your *Microsoft Windows 3.0* desktop aren't likely to become instant throw-aways. In fact, most of the items listed below are necessary if you want to make *Windows 3.0* be all it can be.

Although *Windows* comes with Calendar, Calculator, and Cardfile accessories, they are basic features. For those who need more than *Windows* can offer, programs such as *Almanac* and *DeskTop Set* offer dramatically enhanced versions of these standard utilities, whose functions are ample justification for their extra cost. Accessories not included with *Windows*, notably phone dialers, are also widely available. And products like *FirstApps* and *WinSleuth* go beyond *Windows*, offering accessories for desktop and window management and system analysis.

Some of these accessories are shareware and only require the investment of



time and telephone charges to get a hands-on look. But all comprise a group that enhances your *Windows* desktop—and your *Windows* workday.



IMPACT SOFTWARE

Almanac

Almanac, from Impact Software (\$34.95), is a shareware calendar program that uses *Windows*' multiple-document capabilities and its ability to overlay graphics from one file onto another to good advantage.

When you start it, *Almanac* looks like a standard desktop calendar that displays the current month, its main events, and short-form numerical versions of the previous and following months. A smaller dialog box, called the Brief DayView, lists any event shown on the monthly calendar for that day.

The strength of *Almanac*'s monthly calendar lies in its flexibility. Events that show up on your monthly calendar are stored in overlay files so that you can mix and match groups of events. For instance, you might include regular weekly events in one overlay file and store ordinary appointments in another. Any event in an overlay file can be customized in terms of its appearance on the monthly calendar; dates, for example, can be shaded with any of eight colors in order to distinguish the various types of events. You can open up to ten different overlay files simultaneously.

Three standard overlay files (the national holidays for the United States, Canada, and Sweden) come with the package, and, of course, you can make as many of your own overlay files as you wish. Configuration options let you show the Jewish calendar instead of the Gregorian calendar, and you can show the Christian and Jewish holidays at the same time.

For the astronomy-minded, the Brief DayView shows the time and azimuth directions of the sunrise and sunset for that day. You also have the option of displaying the moon's phases. *Almanac*'s dynamic calendar adjusts the sun and moon information for your location, using a database of the world's major countries, states, and cities. This location database can be updated, and there are simple instructions for adding information on the time zone, latitude, and longitude.

In addition to its calendar functions, *Almanac* also includes a complete daily scheduler. These facilities appear as five separate entities on your *Windows* desktop. A date changer lets you look at different daily schedules, the Brief DayView mentioned above gives you a day at a glance, and a clock shows the current time. The Day Viewer gives you a conventional appointment list, complete with adjustable event alarms. Finally, there's a notepad that lets you attach notes with up to 800 characters to any schedule entry; though it's fairly rudimentary, you'll find it handier than scribbling down notes about each appointment.

Almanac's printing facility is admirably simple. You can print yearly and monthly calendars, general notes and schedules for a range of dates, or all the information for a single date. *Almanac* gives you full control over its font selections in the Print dialog box, making it a snap to format your printed calendars and lists.

Though the current version can't include daily events directly on the monthly calendar (the vendor is looking for a way to do this in a future release), *Almanac* is nevertheless a worthy replacement for *Windows*' own Calendar.



OKNA CORP.

DeskTop Set

As the name implies, *DeskTop Set* is a collection of accessories for your *Windows* desktop—and what a collection it is! For \$149, it offers a dialer, an address book, a calendar, and a calculator, which all work together so well that the complete set stands up admirably against full-fledged personal information managers.

DeskTop Set's address book (called the Phone Book) goes to great pains to look exactly like a paper address book. Alphabetical tabs let you move from page to page as you would in a real address book, and a click of your mouse opens up an alternate "yellow pages" file, which you can use to distinguish different categories of entries, such as business and personal addresses. Each Phone Book entry can hold up to six phone numbers, and you can group entries by category so that individual numbers within the same business can be linked and then viewed as a group. A direct search feature has been added to the product's already excellent

Seagate and Novell Join Forces for First NetWare Ready® Disc Drives.

It shouldn't surprise you. Seagate and Novell together announce an important new development in storage for network computing. The first NetWare Ready® disc drives. NetWare Ready Wren® disc drives from Seagate.

Now truly NetWare Ready drives can be



installed in minutes in network file servers for Novell systems. That saves you from the time and expense of lengthy CompSurf processing.

Only NetWare Ready Wren drives pass demanding lab tests by technical quality teams at both Seagate and Novell. The result is a special factory-recorded NetWare Ready signature that is immediately recognized by NetWare operating systems.

Not only have these drives undergone months of Novell's rigorous lab testing requirements, but Seagate's automated manufacturing and test processes ensure that every drive shipped meets the NetWare standard.

Our family of NetWare Ready Wren drives is available now in 376 and 766 megabyte capacities. An additional series of Wren SCSI, half-height and full-height models—from 125 to 1,200 megabytes—is currently undergoing NetWare Ready qualification.

When Seagate and Novell join forces, NetWare operating system installers and managers now that two tough quality standards have just made life easier.



For complete details, call Seagate at 800-468-DISC or 408-438-6550.

We're ready when you are.

 **Seagate**
The first name in disc drives

Novell, NetWare and NetWare Ready are registered trademarks of Novell, Inc. The NetWare Ready logo is a trademark of Novell, Inc. Wren, Seagate and the Seagate logo are registered trademarks of Seagate Technology, Inc. © 1990 Seagate Technology, Inc.

Never



Peter Norton

When it comes to your crucial data, Peter Norton just won't take **C>FILE NOT FOUND** for an answer. With programs like the Mace Utilities* and PC Tools*, data recovery is often mission impossible. But with the Norton Utilities* 5.0, data recovery is mission *critical*—and it can recover what no other utility can.

Data Recovery is serious business, which requires serious features. And the Norton Utilities has them all.

Norton Does Windows.

The Norton Utilities is *the* safe DOS utility program for use with windowing environments like Windows* 3.0 and DesqView.

Because PC Tools and Mace Utilities are blind to multi-tasking, they can irreversibly damage your files. While the Norton Utilities 5.0 offers three full levels of safety checks under Windows 3.0.



With a clear vision of the PC's future, the Norton Utilities 5.0 provides safe Windows 3.0 recovery.

Norton On Networks.

The Norton Utilities is the *only* utility program that provides file recovery on Novell and DOS-compatible networks. So you can use *File Save* along with *UnErase** to recover deleted files,* or *File Fix** to reconstruct Lotus* 1-2-3* and dBASE* files. From any node on the network.

What's more, MIS will appreciate the Norton Utilities' compliance with existing network security restrictions.

System Information provides detailed reports on network information and TSR memory allocation, as well as graphical benchmarks of disk, CPU, network, and general computer performance.

The next best thing to being there is being on the network. And the Norton Utilities 5.0 is the only data recovery tool that is



DATA RECOVERY FEATURES	NORTON UTILITIES	PC TOOLS	MACE 1990
Number of DOS Error Messages With On-Line Advice	75	0	0
Different Types Of Data Loss Problems Solved			
File System Corruption	31	12	15
Physical Hard Disk Damage	6	0	0
Internal Data File Damage (i.e. dBASE, Lotus)	10	0	6
Disk Reliability Testing (Number Of Patterns)	80	0	0
System Information (Topics Reported)	94	15	16
NETWORK file recovery *File Save must have been installed prior to data loss.	YES*	NO	NO
WINDOWS Safe Operation	YES	NO	NO
Failsafe Design	YES	NO	NO
Effective File Encryption That Does Not Require You To Change The Way You Work	YES	NO	NO

Say Die.

Rated #1
Hard Disk Utility
InfoWorld 12/10/90

Norton's Superior Recovery Technology.

The Norton Utilities handles the toughest data recovery situations easily—predicaments other utilities handle poorly, if at all.

Advise explains cryptic DOS error messages in plain English so you can understand the problem, and gives specific recommendations on how to fix it. So your valuable data is not at the mercy of risky trial-and-error procedures.

Unlike the competition, Norton recovery procedures are easy to use and completely failsafe. And because you can UNDO changes, you won't make a bad situation worse. In fact, while using the Norton Utilities your data will even survive a sudden power loss. All in all, it's the safest, most extensive diagnostic and recovery utility available.

And only the Norton Utilities gives you every-

**Norton Utilities 5.0
Adds Features,
Improves Interface**

"Norton's disk utilities now surpass anything you can find in PC Tools Deluxe or The Mace Utilities, and offer safeguards you can't find anywhere else."
—PC Magazine 10/16/90

*Don't just take our word
for it, the proof is in
the press.*

thing you
need for
optimal
system
performance.

The new *Norton*

Cache and the improved *Speed Disk™* make your hard drive faster and more efficient. And *Calibrate™*, which outperforms *SpinRite™*, adjusts the interleave, identifies bad sectors, and even repairs demagnetized

areas of your drive.

So get serious about data recovery. See your dealer for the new Norton Utilities 5.0. To upgrade now call **1-800-343-4714** or fill out the coupon below. For more information, call **1-800-343-4714 Ext. 708** (in Canada, 1-800-465-2266). And in the immortal words of Peter Norton, "Never say die."

CIRCLE 209 ON READER SERVICE CARD

SYMANTEC.

\$59

Upgrade Now and Save \$120!

Mace Utilities and PC Tools users can now get the Norton Utilities 5.0—list price **\$179**—for **\$59**. Just send this coupon to Symantec, along with the title page from your Mace Utilities or PC Tools product manual. Send a check or have us bill your VISA or MasterCard **\$59** plus tax and \$5 shipping and handling.

Norton Utilities 5.0 offer expires February 28, 1991. Valid in U.S. and Canada only. Please allow 4-6 weeks for delivery. Only one upgrade per coupon. For multiple upgrades or POs, call 1-800-441-7234. For Canadian orders, call 1-800-465-2266.

Customer name _____

Company name _____

Address _____

(no PO boxes)

City/State/Zip _____

☐ Check enclosed ☐ VISA ☐ MasterCard

All payments must be made in US dollars drawn on a US bank.

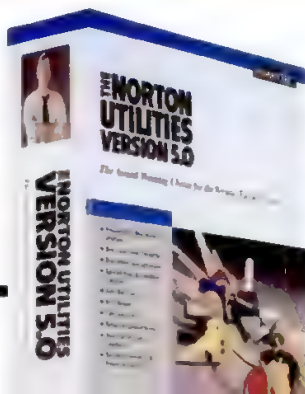
Name as it appears on
your card (please print) _____

Acct. No. _____

Exp. Date ____/____/____ Day phone (____) _____

Quantity	Disk Size	Unit Cost
One	☐ 5 1/4-inch	
	☐ 3 1/2-inch	\$59.00
In these states, add sales tax including applicable local tax: CO 3%; GA, IA, MI, NY 4%; MO 4.225%; IN, MD, MA, OH, WI 5%; DC, FL, MN, PA 6%; CA, IL, TX 6.25%; WA 6.5%; NJ 7%; CT 8%.		
Add shipping and handling:		\$ 5.00
Total:		_____

Send to: **Symantec Corporation**
Attn: "Never Say Die" Offer • P.O. Box 161690
Cupertino, CA 95016-1690 **PC 2/26/91**



©1990 Symantec Corporation. The Norton Utilities is a registered trademark of Symantec Corporation. All other brand or product names mentioned are trademarks or registered trademarks of their respective holders. Novell, Inc. is not associated with the Norton Utilities 5.0 and endorsement is neither expressed nor implied.

For mission critical applications, you need the PCs that were rated Number One.



Some PC applications are just too important to run the risk of downtime. The mission critical tasks.

That's when you need the computers that were rated Number One for reliability in a survey of 20,000 PC Magazine readers.* HP Vectra personal computers.

The survey covered four Service and Reliability categories. In the combined score, our 286, 386SX, 386 and 486 PCs also ranked Number One overall

among the major PC manufacturers. The 17-year MTBF (three times the industry average) on our high-capacity disks is one measure of this dependability.

Our family of high-performance PCs lets you fit the computer to the job. From crucial spreadsheets to CAD and LAN server functions. And we're fully compatible with industry standards, including network operating systems such as Novell NetWare, LAN Manager and 3+Open.

And our extensive network of trained, authorized dealers is backed by HP's award-winning service and support. Together we'll make sure you get what you need when you need it.

So if you have no time for downtime, call **1-800-752-0900, Ext. 1927** for more information and your nearest HP dealer.



**HEWLETT
PACKARD**

Soundex-based phonetic-search facility.

DeskTop Set's Phone Book even includes basic letter-writing and mail-merge capabilities. For example, you can drag a name from the Phone Book into an open *Windows 3.0* word processor document and place that entry's name and address anywhere in the document. You can customize templates for mail-merge, which will be put up on the clipboard for pasting into any word processed file.

The dialer looks much like the touchpad of a standard telephone (including extra buttons for fire, police, and ambulance); you can also dial any entry in your phone list simply by double-clicking on it. There probably isn't a phone system in existence that this dialer can't be configured to handle with ease. An updatable area-code database, which lists the codes for major cities as well as states, lets the dialer insert the proper codes for local or long-distance calls automatically, and additional options cover the complexities of today's deregulated phone environment, from a variety of long-distance carriers and multiple PBX configurations to internal dialing options. A linked phone-log accessory uses Phone Book and dialer information to keep a running list of the calls you make through the dialer.

RICH APPOINTMENTS

When we last reviewed *DeskTop Set* ("Order from Chaos: PIMS Tackle Your Desktop," *PC Magazine*, November 27, 1990), we were less than enthusiastic about its appointment calendar. But the latest version (which also includes rewritten documentation that is clear and simple) makes it as robust as any competitor. Like *Almanac*, *DeskTop Set's* calendar module shows you yearly, monthly, and daily



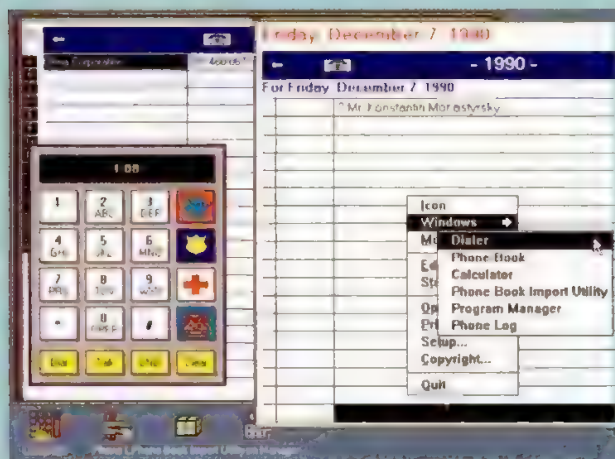
calendars, and lets you add overlays for appointments, holidays, and recurring events. You can see a graphics display of your monthly time commitments by clicking on any day in the yearly calendar, and then clicking again on the bar, which represents any appointment and shows relevant information about that appointment.

An improved To-do list gives you an unlimited number of alarms and prioritizes events. It also lets you attach notes to events, and its powerful search feature makes it easy to cut through a blizzard of appointments. You can also link Phone Book entries to events, allowing you to dial directly from the calendar. You can even link documents and applications to events; for example, if your To-do list includes a note about completing a spreadsheet for a sales meeting, you can create a link that will call up *Microsoft Excel* and the spreadsheet you need to edit at that time. If your computer is off during a time for which you've set an event alarm, *DeskTop Set* will alert you the next time you start it up.

MORE ACCESSORIES

Rounding out this triad are a few other accessories. *DeskTop Set's* full-featured business calculator goes far beyond the four functions of the *Windows* Calculator and offers a storable tape. And almost unnoticed is a nice little text-file viewer that offers bookmarks to keep your place, uses *Windows* screen and printer fonts, and offers a full range of page-formatting options. With the exception of the last accessory, all offer an "expert" mode that uses pop-up menus (which you call by pressing the right mouse button) in place

The heart of the *Desktop Set* is its feature-packed book, calendar, and dialer combination. As an alternative to standard *Windows* menus, most accessories offer "expert" menus that are popped up by pressing the right-hand mouse button.



FACT FILE

Almanac

Impact Software, 12140 Central Ave., #133, Chino, CA 91710; 714-590-8522.

List Price: \$59.95.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: This nicely designed calendar for your *Windows* desktop is far more versatile than the *Windows 3.0* Calendar.

CIRCLE 609 ON READER SERVICE CARD

EDITORS' CHOICE

DeskTop Set

Okna Corp., 285 Van Buren St., Lyndhurst, NJ 07075; 201-460-0677.

List Price: \$149.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: The core of this attractive set of accessories, an address book tightly linked with a calendar and phone dialer, is notable for slick design and an abundance of features.

CIRCLE 610 ON READER SERVICE CARD

FirstApps

hDC Computer Corp., 6742 185th Ave. NE, Redmond, WA 98052; 206-885-5550.

List Price: \$99.95.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: A miscellaneous bundle of utilities glued together with an innovative MicroApp manager, this collection offers some useful capabilities as well as simply fun ones.

CIRCLE 611 ON READER SERVICE CARD

WinSleuth

Dariana Technology Group, 6945 Hermosa Circle, Buena Park, CA 90620; 800-541-6579, 213-670-5606.

List Price: \$149.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.

In Short: Though not indispensable, this hardware and software analysis utility can be a big help if your *Windows* configuration goes awry.

CIRCLE 612 ON READER SERVICE CARD

of the standard *Windows* menu bars.

DeskTop Set's individual components are rich in features, so it takes some time to fathom all the options. But once you become comfortable with the way they work together (Okna's new manual helps a lot), you'll be hard-pressed to find a faster or more convenient way of managing your daily tasks.



hDC COMPUTER CORP.

FirstApps

The heterogeneous utilities in hDC's *FirstApps* tend to fall into two categories: the useful and the merely neat. Although this \$99.95 collection sometimes leans more heavily toward the latter than the former, the features deemed useful among these nine *Windows* enhancement programs are very useful.

The heart of the *FirstApps* utility is the MicroApp Manager, which is normally set up to load when you start *Windows*. It replaces the Spacebar graphic in the upper-left-hand corner of the current window with a red hDC block (this red block can also be set up as a "tear-off" icon that floats around your desktop for easy access). The MicroApp Manager gives you access to a list of applications, as well as all the standard-control menu functions. This convenient system is used to run all the various MicroApps that are included with *FirstApps*, and it is extensible—in fact, at our press time hDC Computer Corp. had already announced *File-Apps* and *Icon Designer*, which both use the MicroApp Manager.



AS YOU WERE

The most useful of *FirstApps'* applications is its Work Sets module. As its name implies, it lets you save sets of files and applications as groups that can be called up in a single action. Work Sets saves the window position and files of applications and lets you load them in any manner you wish—iconized, windowed, or full-screen—so it's easy to group the tools you need for a given task. Want a desktop publishing workstation? Create a work set to load *Ventura Publisher*, *Paintbrush*, and your other desktop publishing tools in side-by-side windows on bootup. Want a sales workstation? Choose another work set and have your database, spreadsheet, and phone dialer loaded and ready to go, all with a couple of mouse clicks.

FirstApps offers some other useful facilities. Its Autosave feature lets you set an interval of time or number of keystrokes, after which the file in the currently active window will be saved automatically. This can be handy if you often forget to save your work, and it is also an effective guard in the event of a power loss. Its full-featured Alarm Clock allows you not only to set an unlimited number of alarms (including those read from *Windows* Calendar files), but it also allows you to use different tones for different alarms.

The Art Gallery is a handy utility for those who deal with a lot of graphics files. It lets you create libraries of graphics images (in .BMP or .WMF format), displaying them in thumbnail form so that it's

easy to select and paste them into your *Windows* applications. You can also use the Art Gallery to create animations that can be used with *DeskTop's* animated screen saver.

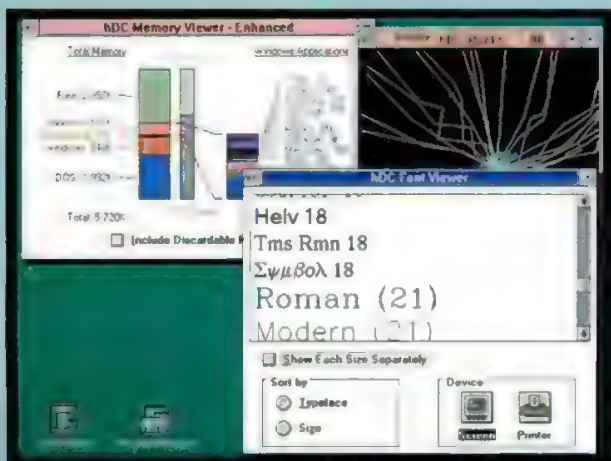
HANDY FOR SOME

FirstApps' other capabilities are more a novelty than they are essential, but they can be handy in some circumstances. The System Enhancer module, for instance, is really useful only if you regularly work with many open windows; it lets you open any application without having to return to the *Windows* Program Manager and lets you close all your open windows at once.

Similarly, a Memory Viewer, which gives you a full graphics representation of each memory segment in low and high memory, shows you everything you need to know about your *Windows* memory usage, but this information is merely eye-catching unless you know what you're looking at.

For desktop publishers and others, the Font Viewer lets you look at all the currently-installed *Windows* fonts—a handy feature when you want to audition fonts before placing them in your document. The Character Set module gives you instant on-screen access to special typographic symbols, such as the copyright symbol within your fonts, and you can easily pick the symbol you want and paste it directly into your document.

Whether nifty or useful, *FirstApps'* varied facilities offer something for everyone. You'll probably find something that you can't do without.



hDC's *FirstApps* gives you a group of handy utilities, instantly accessible from the *Windows* control menu, including a font viewer and a memory viewer. Its Work Sets let you launch any combination of *Windows* programs in a single operation, arranging the windows to suit your needs.

DOS

stroke stroke stroke
stroke stroke stroke
stroke stroke stroke
stroke stroke stroke
stroke stroke stroke
stroke stroke stroke

Direct Access

stroke

Here's a hardworking menu program that really lowers your handicap.

Getting into the programs on your hard disk with DOS commands can take longer than a foursome full of beginners. You should be using Direct Access.

All you do is load it and forget it. Direct Access lines up every program on a menu and lets you create custom sub-menus for related programs and other applications.

It's simple.

And it's complete. With features like user-defined screen blanking, password protection, three-level virus detection, mouse support and a unique feature that automatically tracks all time spent on your programs.

A network version is also available. You can

even customize the menu with your company logo.

The choice is easy. Keep stroking away with DOS commands. Or play through to your programs with Direct Access.

Call now for complete details, volume discounts and your nearest Direct Access dealer. For a limited time, get Pyro!™ The Entertaining Screen Saver for the PC, free! Just write "Pyro" on the Direct Access registration card before you return it.



PC Magazine Editor's Choice

CIRCLE 288 ON READER SERVICE CARD



**DARIANA
TECHNOLOGY GROUP**
WinSleuth

WinSleuth, a \$149 software package from the Dariana Technology Group, is the first full-fledged diagnostics program for *Windows* 3.0. Its eight modules give you all the information you need to know about your *Windows* workstation, from your current hardware setup to suggestions for drive configurations. Although much of the information *WinSleuth* provides is quite esoteric, beginners as well as seasoned experts will find value in the program.

WinSleuth's Power-On Status Module, for example, checks the status of your computer's CMOS battery. Should it report an error, you can save yourself a call to the repair shop, since *WinSleuth* will have indicated why your computer is losing its configuration information, and that it can be fixed by a simple replacement battery. The Power-On Status Module also makes sure that power to the CMOS Real Time Clock hasn't been interrupted, as well as verifying the amount



of memory installed and checking your hard disk controller.

UNDER THE HOOD

For more detailed statistics, you can turn to *WinSleuth's* other modules. Its RAM Information module, for example, gives a

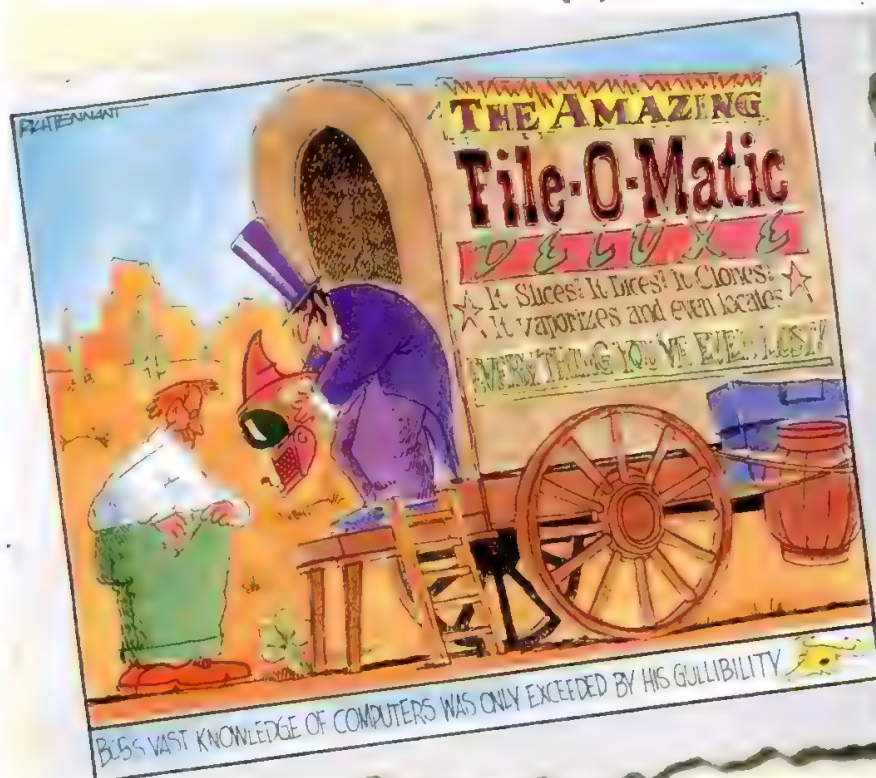
**WinSleuth provides
suggestions for
configuring *Windows*
for best performance.**

host of information about your PC's memory usage under *Windows*. The Hard Disk Information Module shows some essential disk drive information, including the total available and unavailable disk space, while the I/O Card Area Information Module shows the addresses and

copyright information of the add-in boards installed in your machine. A Printer Information Module will tell you more than you'll ever want to know about your printer.

In addition to helping you get under the hood of your computer, *WinSleuth* will also help you to optimize your software configuration. The MS-DOS Information Module will give you information about your DOS environment, including the DOS version number and installed device drivers, while the *Windows* Information Module will tell you your current *Windows* operating mode and will also list all the *Windows* applications that are currently open, with their respective memory footprints.

Of greatest value to new users, however, is *WinSleuth's* Tune-Up Module, which evaluates your current *Windows* setup and provides you with a number of suggestions for configuring it to its best performance. It takes into consideration such factors as processor type, the amount and type of memory, and the amount of free disk space, and it can provide information on three different levels: Beginner, Intermediate, or Advanced. An ex-



cellent help facility gives clear and concise explanations.

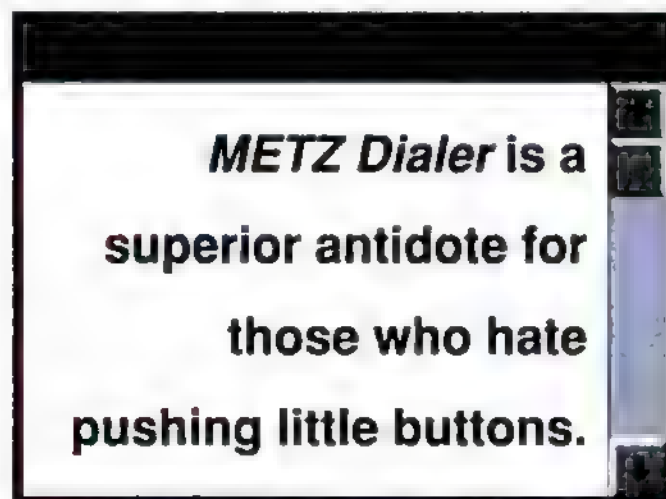
While *WinSleuth*'s facilities may not be needed for day-to-day use, there are times when an exhaustive on-line look inside your system is essential. *WinSleuth* is a fine tool for experts and an educational tool for beginners.

ADDITIONAL ACCESSORIES

If you're tired of wrestling with Cardfile to make it a suitable substitute for your Rolodex, try *METZ Phones*. This \$20 shareware address program offers features such as U.S. area codes, foreign country codes, and a pop-up direct-dial phone pad. A simple pushbutton interface not only lets you find any individual in the phone book, but also brings you to the beginning of each section of the alphabet, much as a mechanical Rolodex would. *METZ Phones* logs calls made from *Phones*' database entries and tracks the time of each call, as well as the number of calls made to that person. It can save and merge various types of data files, including old *SideKick* phone lists.



METZ Phones reads Cardfile files directly, but if you need to import a database into Cardfile or to export the information to another application, your best bet is *WinCrd*. This handy, free utility, which is available on CompuServe, runs in a DOS window and converts ASCII



files to the *Windows* Cardfile format and vice-versa.

If you'd like your computer to dial for you but don't need a complete address book, try *METZ Dialer*, a superior antidote for those who hate pushing little buttons. This \$10 shareware phone dialer

keeps a simple database of names and numbers, and dials when you double-click on the name. You can also dial direct by clicking on the phone pad.

A useful tool for technical types is *HP Calc*, a sophisticated replacement for the standard *Windows* Calculator. *HP Calc* emulates a Hewlett-Packard scientific calculator (the computer you had *before* you had a PC) with remarkable fidelity. Provided that you're comfortable with reverse Polish notation, you will find that *HP Calc* is handier than keeping the real thing next to your computer. It's available on CompuServe.

MEMORY UTILITIES

Even with *Windows* 3.0's ability to use all your memory efficiently, it's still handy to know where you stand, especially if you have several applications going at once. *METZ FreeMem* (\$10) shows the amount of memory that you still have available for new applications. A more sophisticated memory viewer is *K-Free*, distributed as shareware by Dragon's Eye Software (registration fee, \$25), which shows not only the amount of *Windows* memory still available but also the current

NOW READ WHAT THE REAL EXPERTS SAY ABOUT XTREE.

"It stands alone as the fastest, most imaginative and most capable file manager you can find."
PC Magazine

Some software companies would have you believe their file management packages do everything but make coffee. But nobody's fooling the pros. With its long list of practical, usable features, *XTree* has been their favorite for years. *InfoWorld* says, "This comprehensive DOS shell is packed with advanced features that appeal to power users."

Features like an application menu that lets you launch applications right from *XTree*. And when you're launching applications it shrinks back to 7K. Like an *Open File* command that makes starting applications and their associated data files as easy as pointing and shooting. Like split screens, so you can view two directories or drives at once. Like text search. And *AutoView*, so you can browse through files without starting up the application.

Now, there's an even better reason for managing your files with *XTree*. It's *XTreeGold 2.0*, with some important new features that make it better and more useful than ever.

Introducing New XTree Gold 2.0. With Simplified Pull-Down Menus, "Un-Delete", And Autobuild Menu Creation.

With *XTreeGold 2.0*, you can choose between our original keystroke command line or our new pull-down menus.

You can "un-delete" files that have been accidentally erased.

Create an application menu automatically with *Autobuild*, which will search your disk for more than 700 popular applications.

View more data files than ever with our newly expanded viewer list.

And add PKZip compatibility to our file compression system, to get more out of your hard disk.

What's more, we've made many of our standard features faster, better, and easier.

In short, the file manager that impressed the pros is more impressive than ever.

For more information or the name of the *XTree* dealer nearest you, call 1-800-388-3949.



XTREE
C O M P A N Y

The world leader in disk management

XTree and XTreeGold 2.0 are trademarks of Executive Systems, Inc.



CIRCLE 199 ON READER SERVICE CARD

15. And through March 31, 1991 anyone can trade in other file managers and receive *XTreeGold 2.0* for \$50.00. Call 1-800-282-5003.

Windows operating mode, the CPU type, and the largest block of memory currently in use. *K-Free* also indicates the amount of free space you have on all of your disk drives, including network drives. Though this is a lot of information to keep on-screen at once, *K-Free* can be configured to show just the items that you really want to see.

METZ Phones

METZ Software, P.O. Box 6042, Bellevue, WA 98008-0042; 800-447-1712, 206-641-4525.

List Price: \$20.

CIRCLE 613 ON READER SERVICE CARD

METZ Dialer

METZ Software, P.O. Box 6042, Bellevue, WA 98008-0042; 800-447-1712, 206-641-4525.

List Price: \$10.

CIRCLE 614 ON READER SERVICE CARD

K-Free

Dragon's Eye Software, P.O. Box 200262, Arlington, TX 76006-0262; 817-265-5619.

List Price: \$25.

CIRCLE 615 ON READER SERVICE CARD



SCREEN AND MOUSE ENHANCERS

by Barry Simon

The Windows desktop is a convenient working surface, but it's not always large enough to suit your needs. And when you walk away from it, you want to know that your screen is safe from burn-in and your work is safe from prying eyes.



INNER MEDIA INC.

WideAngle

If you need to keep a number of programs on-screen but don't want to wade through a field of overlapping windows, Inner Media's *WideAngle* may be just the tool for you.

WideAngle (\$129) gives you a large virtual workspace broken into nine screen-size "desktops." These are arranged in a three-by-three array and numbered just

FACT FILE
EDITORS' CHOICE

WideAngle
 Inner Media Inc., 60 Plain Rd., Hollis, NH 03049, 800-962-2949, 603-465-3216.
List Price: \$129
Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, Microsoft Windows 3.0, DOS 3.1 or later. Mouse recommended
In Short: This useful screen expander gives you nine desktops and is enormously helpful if you need to keep several full-scale applications open at once.

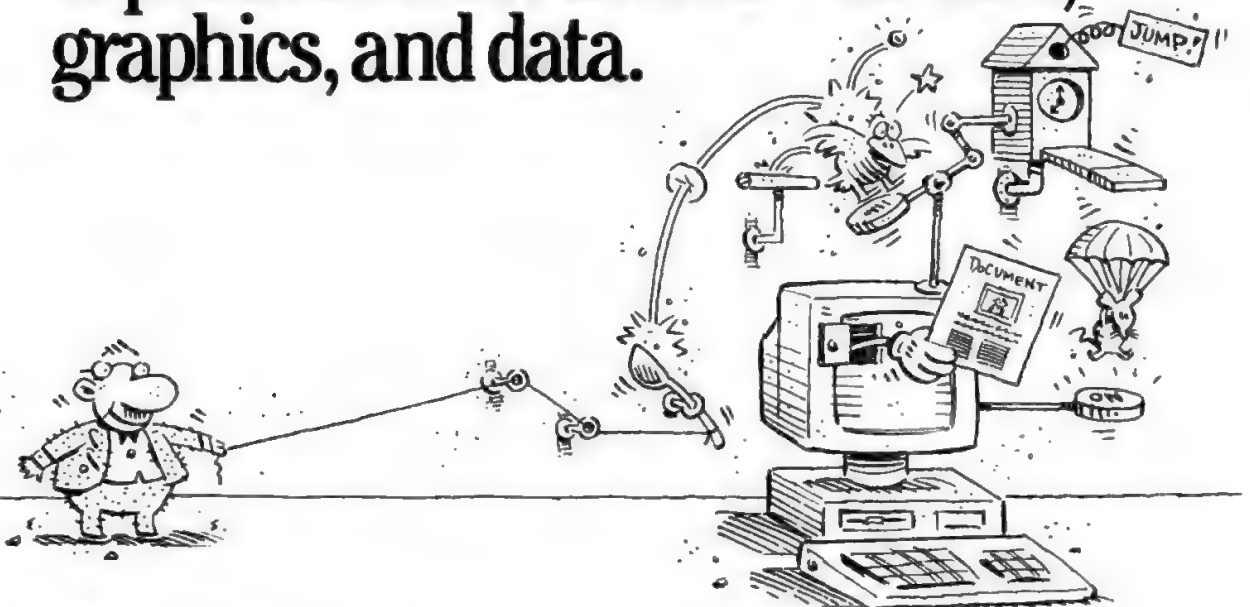


CIRCLE 616 ON READER SERVICE CARD

like your numeric keypad. You can keep various applications as full screens on different desktops and have easy access to them without having to traverse a crowd of overlapping windows.

In each of the nine desktops, *WideAngle* is available in one of three modes: icon,

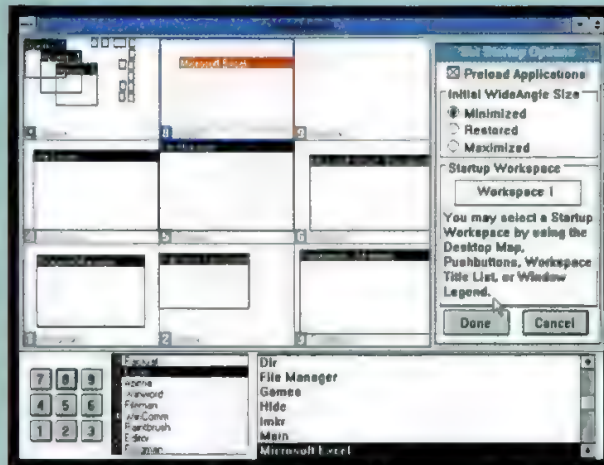
You can go to great lengths to produce a document with text, graphics, and data.



small window, or full screen. As an icon, it displays a small three-by-three picture that looks like the keypad. Clicking on a



number on this keypad icon will take you to the corresponding desktop. The small-window version also includes a list of names you can assign to the desktops and a larger set of buttons. The full-screen mode includes a full task list and an overview of all nine desktops with the names and positions of windows and icons on each desktop. In this full-screen mode you can move applications from one desktop to another by dragging them.

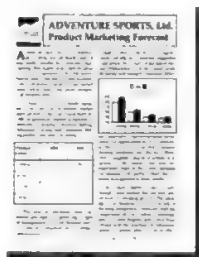


WideAngle's full-screen mode provides an overview of the nine desktops. Other modes give a smaller list of desktops or a simple keypad icon that floats to the top and is instantly available whenever you're working.

You can configure *WideAngle* to open various applications in assigned desktops when *Windows* starts. This is by far the most convenient way to use the program, but it requires enough memory to keep a number of applications open. So, while *WideAngle* itself only takes about 90K RAM, you need a lot of memory to make the program useful. You should also be

aware that *WideAngle* and the *Windows* Task Manager do not mix very well; the Task Manager cannot switch between desktops, and its cascade and tile commands move all open applications to desktop number one.

Some features could be added, including easier movement to DOS applications, hotkeys to switch among desktops,



Or you can get Legacy.

You'll find all kinds of bells and whistles built into other advanced word processors. And while they might seem appealing at first, using them to create high-impact documents means you spend a lot of time just spinning your wheels.

But not with Legacy. Because Legacy was designed specifically to give you the best combination of word processing, graphics and desktop publishing in one complete program. Its unique frame-based design and powerful word processing lets you create high-impact documents easier and faster than with any other advanced word processor. All on one screen, without ever exiting your document.

Using *Windows* 3.0, Legacy makes things simple with pull-down menus and dialog boxes. And full WYSIWYG ability makes editing easy in any view. In fact, everything is easy with toll-free support, on-line tutorials and context-sensitive help. All for only \$495.

Call 1-800-NBI-1111 or your software dealer for more information. And see how, with Legacy, you can get a jump on your work. Without having to jump through hoops.



Trade up your current word processing or desktop publishing software to Legacy for just \$150.

CIRCLE 275 ON READER SERVICE CARD

and the ability to move between adjacent desktops by dragging the mouse off-screen. But if you need to keep a number of programs on tap at all times, *WideAngle* does the job.

ANOTHER SCREEN EXPANDER

Though it wasn't on the market in time for this article, another screen expander, *MoreWindows* from Aristocad, should be available for *Windows 3.0* by the time you read this. In contrast to *WideAngle*, which creates nine separate desktop areas, *MoreWindows* is a set of screen drivers that creates a single, vastly enlarged virtual *Windows* desktop, with your VGA monitor acting as a porthole. This design has its advantages. Because the desktop is larger than your monitor, you can create large spreadsheets or document windows. Because *MoreWindows* uses the panning and scrolling hardware on your VGA card, you can move from one part of the desktop to another instantaneously with a click of the mouse. The software's disadvantage is that dialog boxes always appear in the center of the virtual desktop, which may be off-screen.

SCREEN BLANKERS

Windows' bright screen threatens your monitor with burn-in, so you'll want to be sure to invest in a screen blanker. A number of general purpose utilities (such as *Command Post*) can blank the screen after a period of inactivity. But if experience on the Macintosh is any guide, you may prefer to have a specialized program that



puts an animated display on your screen instead of just blanking it.

Fortunately, screen blankers are both plentiful and cheap. *Intermission*, the successor to a popular shareware blanker called *Screen Peace*, is the best. It allows you to pick or define a subset; blanking a module, it then chooses randomly from that group. My favorites were fireworks, a lovely mosaic pattern, a kaleidoscope, and swimming fish, but with over thirty modules to choose from, you'll have many different choices. You can also password-protect the program.

Another useful screen blanker comes with the *Microsoft Entertainment Pack for Windows* (\$39.95). Along with seven games (Warning: *Minesweeper* is addictive), it includes a screen blanker called *IdleWild*, which gives you a choice of seven blanking modes. While not as flashy as *Intermission*, the Microsoft name and the games are likely to make the *Entertainment Pack* a popular choice.

METZ Lock, a \$10 shareware screen blanker, blanks your screen upon request or after a specified interval, and requires a password to unblank the screen. You can display any bitmap placed on the clipboard on the blanked screen. *Magic* is a \$25 shareware screen blanker that displays a lovely floating line pattern on the screen, while *Winker* is a free screen blanker whose most noteworthy feature is an icon whose large pair of eyes follow your mouse cursor around the screen—a real conversation piece.

Finally, though it was not released at the time of this review, the *After Dark* program from Berkeley Systems is worth

looking at. A *Windows 3.0* version of this popular Macintosh screen saver should be on the market by the time this issue hits the newsstands.

Windows' bright screen threatens your monitor with burn-in, so you'll want to be sure to invest in a screen blanker. Fortunately, they are plentiful and cheap.

Intermission

ICON Simulations
648 S. Wheeling Rd., Wheeling IL
60090; 708-520-4440.

List Price: \$49.95.

CIRCLE 617 ON READER SERVICE CARD

Microsoft Entertainment Pack for Windows

Microsoft Corp., One Microsoft Way,
Redmond, WA 98052-6399; 800-426-
9400, 206-882-8080.

List Price: \$39.95.

CIRCLE 618 ON READER SERVICE CARD

METZ Lock

METZ Software, P.O. Box 6042,
Bellevue, WA 98008-0042; 800-447-
1712, 206-641-4525.

List Price: \$10.

CIRCLE 619 ON READER SERVICE CARD

Magic

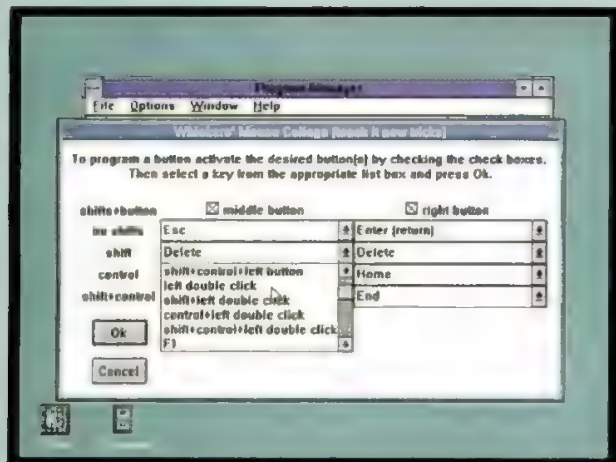
Dynamic Information Systems, Unit 4,
3530 15th St. SW,
Calgary, Alberta, Canada T2T 4A3; 403-
243-0296.

List Price: \$25.

CIRCLE 620 ON READER SERVICE CARD

MOUSE ENHANCERS

The need for enhancing the flexibility of the mouse in *Windows* has produced sev-



The handy mouse utility, *Whiskers*, lets you assign key combinations to eight different mouse key combinations.

THE NEXT TIME SOMEONE ASKS YOU ABOUT AN ENTRY LEVEL NOTEBOOK PC HAND THEM THIS.



Chances are, people who don't know about PC's are constantly asking you for advice. Especially when it comes to their first notebook PC. Which is precisely why this ad comes in handy.

With it, they can learn all about our T1000LE. An exceptional, six-and-a-half pound notebook PC that has a 3.5", 1.44MB floppy and a powerful 20MB hard disk that can store virtually anything from short stories to the complete works of Shakespeare. They'll see that it comes with an adjustable sidelit LCD screen and 640 x 400 bit-mapped graphics. All of which means that the T1000LE isn't only easy to read, but it's easy on the eyes as well.

T1000LE
6.5 pounds, 9.54MHz 80C86, 20MB hard drive with 23 msec access; 1.44MB 3½" diskette drive; 1MB RAM expandable to 9MB, CGA compatible screen with 640 x 400 resolution, 82-key sculptured keyboard with eight dedicated cursor control keys, parallel port, serial port, removable, rechargeable battery, AC adapter, AutoResume.*

Add to that, a sleek full-function keyboard that feels just like a desktop PC. And, unlike many notebook PC's, the T1000LE allows them to work for up to three hours anywhere they want. So the next time someone asks you about a versatile notebook PC, you can do one of two things: Send them to their nearest Toshiba dealer. Or, simply hand them this ad.

For more
information call
1-800-457-7777.

In Touch with Tomorrow
TOSHIBA

Toshiba America Information Systems, Inc. Computer Systems Division

© 1990 Toshiba America, Computer Systems Division

CIRCLE 169 ON READER SERVICE CARD



★ Computerized Classic Accounting

(Absolute Solutions)

Now, for the first time, a general ledger, accounts receivable, accounts payable, inventory control program that looks like manual books yet offers all the advantages of computerization.

Accounting the way you've learned it, utilizing the ease of Microsoft Windows 3.0 graphic interface and the power of the Microsoft Excel spreadsheet. **\$219.**



NEW!

★ Microsoft Entertainment Pack

(Microsoft) Take a break from work and challenge yourself with games from Microsoft: Taipei, an oriental game of skill; Minesweeper, an exciting test in logic; Tetris, the arcade hit; Tic Tactics, a new, more spirited game of tic-tac-toe and more. When you're not playing games, protect your screen with one of many exciting screen savers. **\$23.**

★ CorelDRAW! 2.0

(Corel Systems)

CorelDRAW! is the award winning PC graphics software that gives you incredible type control and superb drawing power in a value-packed program. Now, CorelDRAW! 2.0 comes with more drawing power, over 150 fonts; over 3500 clipart images and symbols; 31 import/export filters; an autotrace utility, a font conversion program and Mosaic, a visual file manager. **\$369.**



★ Ami Professional 1.2

(Samna)

Create your documents and page layouts at the same time. Ami Professional brings the graphical interface of Windows 3.0 to word processing. Featuring advanced WYSIWYG display that not only shows you what your documents will look like, but will show you as you are writing them. **\$305.**

★ Wide Angle

(Inner Media)

Spread your work out with Wide Angle. It expands your desktop by 9 times and lets you work with all the programs you need without shrinking windows. With Wide Angle, you can move to another workspace with a simple click of a mouse. Design and customize your own work environment and Wide Angle will automatically load it at the start of every session. **\$85.**

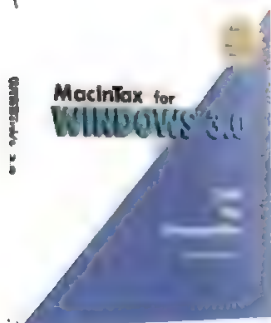


NEW!

★ MacInTax for Windows 3.0

(Softview)

Prepare your taxes easily and accurately on MacInTax for Windows, the tax program that can put over 75 forms onscreen in the exact IRS format. MacInTax for Windows has been redeveloped to make the most of the Microsoft Windows 3.0 environment. This innovative program will check your input, prevent illogical, inconsistent or incomplete entries, perform all calculations and leave a complete audit trail. **\$59.**



Kensington	
Masterpiece Plus	95.
Powerbacker 350/360	249.
Maxell Disks (box of 10)	
3 1/2" DS/DD (720k)	19.
3 1/2" DS/HD (1.44Mb)	29.
Microref	
Keyboard Templates (various)	Call.
Perma Power	
SPS 500L; SPS 250	499/249.
Sony (box of 10)	
3 1/2" DS/DD (720K)	19.
3 1/2" DS/HD (1.44Mb)	22.
Targus	
Premier Leather Case	189.
Leather Laptop Case	139.
Nylon Laptop Case	54.

DRIVES/CD ROM

Iomega	
5.25" 44Mb Storage Cartridge	85.
20Mb Cartridge	55.
Bernoulli Transportable	990.
MicroSolutions	
backpack	259.

MicroWarehouse
YOUR
WINDOWS
SOURCE!

ORDER
24 HOURS
A DAY, 7 DAYS
A WEEK!

★ Windows-compatible products

COMPUTERS

ALR	
ALR PowerFlex 286/40Mb	1199.
ALR 386SX PowerFlex Module	345.
Sharp	
Wizard 7200 w/ 64K	236.

MEMORY

Samsung	
DRAM 1Mb 80ns/100ns	8/9.
SIMM 1Mb 70ns/80ns	76/72.
SIMM 1Mb 100ns	68.
SIMM 256K 100ns	25.

EXPANSION & UPGRADES

All Computer	
Alt Charge Card with Adaptors	327.
AST Research	
Sixpak 286 with OK	99.
ATI	
VGA Wonder w/512k	324.
Comuter Elektronik Infosys	
PS/1 Memory	249.
Creative Labs, Inc.	
Sound Blaster	165.
Digital Vision	
Computer Professional Series	349.
Intel	
Co-Processor 80387SX	305.
Co-Processor 80287-10	245.
Co-Processor 80387-20	433.
Inboard 386/PC - 1MB	529.

MEDIA & ACCESSORIES

BASF Disks (box of 10)	
5 1/4" DS/HD (1.2Mb)	11.
Canon	
Auto Sheet Feeder for BJ-10e	72.
Compucable	
Switch Box 2-Position	19.
Curtis	
Command Center	85.
Computer Tool Kit (52 pc)	45.

NEC	
CD-ROM Portable CDR-35	439.
Interface Kit (XT/AT)	144.
Plus Development	
Hardcard II 80 (19ms)	689.
Solutions for Your PC/XT	
3 1/2" 1.44Mb Floppy & Ctr.	127.
3 1/2" 720k Floppy & Ctr.	119.

PRINTERS & CARTRIDGES

Adobe	
Adobe PostScript Cartridge	269.
Adobe Type Cartridge	235.
★ Adobe Plus Pack for PC	109.
AEG Olympia	
NP80-24E Printer	329.
Canon	
BJ-10e Bubble Jet	339.
Laser LBP8 Mark III	1579.
LBP4 Laser	999.
Citizen	
GSX-140 Color Printer	345.
Elite Business Apps	
Charisma 25/Plus	299.
Charisma Series Fonts (various)	Call.
Insight Development	
PrintAPlot	123.
PrintTools	89.
MetroSoftware	
PC Artifax	79.
Pacific Data Products	
25 Cartridges in One!	269.
Pacific 4 Memory w/ 2Mb	189.
Pacific Outlines I or II	209.
Pacific Page Personal Edition 4.0	369.
Panasonic	
KX-P1124 Dot Matrix	299.
QMS	
PS410	2160.
Seiko Instruments	
Smart Label Printer	189.

MODEMS & FAX BOARDS

Best Data	
Modem, 2400X	119.
Smart One Fax9624 (Int)	189.
Cardinal	
★ 4800 SendFAX Modem	99.
Complete PC	
The Complete Communicator	569.

CHECK OUT OUR PRICES!

OVERNIGHT DELIVERY
Only \$7.00

The Complete Fax/9600	435
Delrina Technologies	
★ WinFax	49.
Frecom	
Frecom Fax 96	169.
Hayes	
Ultra 9600 V.32	799.
SmartModem 2400 External	399.
Intel	
2400B MNP External	180.
Satisfaction Classic PC/XT	389.
PowerUser	
Sendfax 24/48	79.
Sendfax 24/96	99.
Send/Receive fax 24/96	199.
2400 Mini Ext.	99.
2400 B Plus Int.	169.
Practical Peripherals	
PM2400SA MNP Ext.	175.
PM2400SA Ext w/ MNP Lvl.5	205.
UDS/Motorola	
FastTALK 9600 V.32/42b Ext.	675.
Zoom Telephonics	
Zoom/Modem HC2400S	99.

INPUT DEVICES

Caere	
The Typist	385.
Calcomp	
WIZ	149.
Fifth Generation	
Logical Connection Plus	589.
Kensington	
Expert Mouse (ser/bus)	99/121.
Kraft	
Toptrak	72.
Logitech	
Scanman	295.
Trackman (bus/ser)	98/88.
Marstek	
MarsMouse E-22	25.
Mars 800 Scanner	215.
★ M-800W Hand Scanner	189.
Microsoft	
Mouse (bus/ser)	85.
★ Mouse w/Windows 3.0 (bus/ser)	145.
MicroSpeed	
Trackball PC-Trac (ser/bus)	69/79.
MicroTouch Systems	
The UnMouse	189.
Migraph	
★ Color Scanner CS 4096	695.
Z-NIX	
★ SuperMouse II (bus/ser)	95/89.

MONITORS

Goldstar	
14" Analog VGA (720x400)	369.
14" VGA 1430	350.

Shipping - Your choice:
Fast, dependable, overnight service -
\$7 up to 7 lbs. Orders for in-stock items
placed by 7:00pm ship same day. Ground
service available - \$3 (same day shipping).

NEC	
Multisync 2A	545.
Multisync 3D	669.

ENTERTAINMENT & EDUCATION

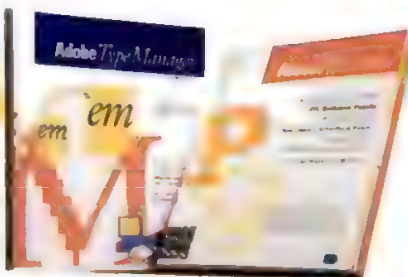
Artworx	
Bridge 6.0	27.
Banner Blue Software	
Family Tree Maker 1.0	45.
Broderbund	
Simcity	29.
The Playroom	27.
Where is Carmen S.D. (various) ..	ea.32.
Where is Carmen S.D. Deluxe Ed.	49.
Centron	
Casino Master	41.
Davidson & Associates	
Alge/Math Blaster Plus!	ea. 29.
Electronic Arts	
Life and Death	34.
Entertainment On Line	
Lottery Tracker & Wheeler	25.
MECC	
Word/Number Munchers	ea.25.
Oregon Trail	25.
MicroAce	
Blackjack	30.
Microsoft	
★ Entertainment Pack	23.
★ Flight Simulator 4.0	45.
Learning DOS	39.
PC Globe Inc.	
PC Globe 4.0	36.
PC USA 2.0	36.
Spectrum Holobyte	
Tetris	23.
Toyogo	
Nemesis Go Master Deluxe	95.
Virgin Mastertronic	
Monopoly	26.
Spirit of Excalibur	26.
Visionary Software	
Synchronicity 2.0	36.

DESKTOP PUBLISHING & GRAPHICS

Adobe	
Adobe Fonts (various)	Call.
★ Adobe Type Manager	55.

★ ATM & Adobe Plus Pack

(Adobe) ATM allows Windows 3.0 applications to display and print high quality text at any size, automatically at any time. Brings scalable PostScript font software to the PC display and non-PostScript printers for the first time. \$55. Purchase ATM Plus Pack and you'll receive 22 additional typefaces. \$109.



★ Color Scanner CS 4096

(Migraph)
The Color Scanner from Migraph includes three separate Windows 3.0 compatible software packages and a half length interface card. Included is a special version of Astral's Picture Publisher Plus, a quick scan and save utility and ImagePrep. Scan and save 4096 colors and save the file in any TIFF format, color, grayscale or monochrome PCX. \$695.



NEW!

FREE!

When you order from
MicroWarehouse

14 Great Programs!

The POWER USER'S TOOL KIT 1.0

The MicroWAREHOUSE technical staff and the publishers of the popular POWER USER'S MANUAL have compiled a great new disk of utilities and applications... **THE POWER USER'S TOOL KIT.**

Fourteen great programs on one handy 5 1/4 inch disk. Including Active Life - a powerful time planner and scheduler for business or personal use, and IconDraw - a hot, new, Win3 utility for designing your own icons.

The POWER USER'S TOOL KIT is FREE from MicroWAREHOUSE when you order from us. If you want the disk, you pay only \$1.50 for shipping and handling. The programs are shareware, so you can try them free of charge. If you wish to continue using them, some authors ask that you pay a fee (\$10-\$150). Many are absolutely free. All of the details are explained on the disk, which is yours to keep.

FREE CATALOG!

We carry more than 1200 PC solutions including all the latest releases and updated versions. Just fill in the information requested below and we'll start your free, one-year subscription to the MicroWAREHOUSE catalog.

I'm Kerry, call me at:

WAREHOUSE

1-800-367-7080

(1-800-DOS-7080)

Inquiries: 908-370-0518 Fax#: 908-905-5245
Order Toll-Free 24 Hours a Day, 7 Days a Week

Free Micro Warehouse Catalog Subscription
1690 Oak Street, P.O. Box 1590, Lakewood, N.J. 08701

Fill out and mail this coupon to receive a free, one-year subscription to the MicroWarehouse catalog.

Name _____
Address _____ Apt. _____
City _____ State _____ Zip _____
(Expect to receive your next issue within 4-6 weeks)

CIRCLE 225 ON READER SERVICE CARD

1PM022

MICROWAREHOUSE CHECK OUT OUR PRICES!

★ Presentation Task Force

(New Vision Technologies)

Clip art for those who mean business. Presentation Task Force contains 1,100 vector graphics in the popular CGM format, making it compatible with most PC charting, drawing and word processing programs. The collection has been designed for business, health care and military professionals, and is suitable for all types of color and black and white printers. **\$134.**



UnMouse

(MicroTouch Systems, Inc.)

Use the most intuitive pointing device ever designed—your own finger. Introducing the UnMouse by MicroTouch. One million touch points and a touch sensitive glass tablet respond instantly to your touch. Unique templates allow you to execute function keys directly from the tablet. Also featuring truly outstanding graphics capabilities. **\$189.**



Total Word

(Volkswriter) Finally, a professional word processing program that's logical and easy to use so you can concentrate on your writing instead of your word processor. If you need to write memos, proposals, reports, scientific papers or the great American novel, Total Word delivers with the ease and flexibility you demand. Pull-down menus, context sensitive help; FREE SOFT FONTS, Spelling Corrector and Thesaurus integrated. **\$209.**



Dream House Professional

(Computer Easy) Use Dream House Professional to draw up your own floor plans and it will automatically calculate square footage and dimensions. Select icons to indicate things such as doors and appliances and use solid or dotted lines to outline walls, patios or sidewalks. Can handle up to almost one million square feet, so it's ideal for both home and industrial users. **\$47.**



PerFORM Designer & Filler 2.1

(Delrina Technology) Same performance, new low price! Save time and money with the award winning product PerFORM Designer & Filler 2.1. Create professional looking forms using logos, fonts, shading and bar codes. Fill in forms using automatic calculations, dBASE and custom look-up windows and dBASE/ASCII file import/export. Includes over 100 sample forms. 60 day money back guarantee. **\$99.**

PathMinder+

(West Lake Data Corp.) Westlake Data proudly introduces the sequel to the award-winning comprehensive disk management system. Benefit by adding your own applications program, keeping organized and manageable files, systemizing all directories for easy disposal and auditing all computer activities for experts and novices alike. **\$76.**



Graph-In-the-Box Executive

(New England Software) Graph-In-the-Box Executive is the only program you'll need to create professional quality business graphs. Choose from 15 different types of charts, text charts and organization charts; use nine different fonts, 3D effects and 57 other built in data manipulation functions and procedures for mathematical and statistical analysis. **\$159.**



Aldus	
★ PageMaker 3.01	495.
ArtRight	
★ ArtRight Images Vol. 1 or 2	85.
★ ArtRight Images (various)	85.
AutoDesk	
★ AutoDesk Animator	249.
Bitstream	
★ FaceLift for Windows	58.
FaceLift for WordPerfect	58.
Broderbund	
New Printshop	35.
New Printshop Companion	29.
Caere Corporation	
★ Omnipage 2.1 386	419.
Corel Systems	
★ CorelDRAW! 2.0	369.
Custom Applications	
★ Freedom of Press Light 2.5	60.
hDC Computer Corp.	
★ Icon Designer	35.
Micrografix	
ClipArt (various)	Call.
★ Designer 3.01	469.
★ Charisma	344.
Microsoft	
★ Powerpoint for Windows	319.
New Visions Technology	
★ Presentation Task Force	134.
Power Up Software	
Express Publisher 2.0	83.
Software Publishing	
Harvard Graphics 2.3	329.
Timeworks	
Publish-It! 1.2	125.
T/Maker	
ClickArt (various)	Call.
Xerox	
Gray F/X	305.
★ Ventura Pub. Gold Series 3.0	549.
Z-Soft	
PC Paintbrush IV Plus	109.

CAD PRODUCTS

American Small Business Co.	
Design CAD 3D 4.0	226.
AutoDesk	
Autosketch 3.0	146.
Computer Easy	
Dream House Professional	47.
Foresight Resources	
★ Drafix Windows CAD 3.0	445.
Generic Software	
Generic CADD 5.0	235.

BUSINESS

Abacus	
★ Becker Tools	48.
Absolute Solutions	
★ Computerized Classic Acct.	219.
and Software, Inc.	
★ Planisoft	139.
Ashton Tate	
dBASE IV 1.1	479.
Ask Sam Systems	
askSam 4.2	172.

Avery	
Label Pro	49.
List & Mail Plus	38.
Bell Atlantic Corp.	
★ ThinX	323.
Bloc Publishing	
Form Tool Gold	58.
Borland International	
Paradox 3.5	529.
Quattro Pro 2.0	335.
Buttonware	
PC File	72.
Central Point Software	
Central Point Backup	59.
PC Tools Deluxe 6.0	85.
Chronologic Corp.	
Instant Recall	64.
Chronos	
Who What When 2.0	179.
Contact Software Int'l	
ACT! 2.0	233.
Crosstalk Communications	
Crosstalk Communicator	65.
★ Crosstalk for Windows 1.1	129.
Crosstalk MK IV 2.0	130.
Crosstalk XVI 3.71	104.
DacEasy Inc.	
Dac Easy Accounting 4.01	89.
Dac Easy Bonus Pak 4.1	159.
Dariana Technology	
System Sleuth Analyzer	39.
System Sleuth Pro	73.
★ Win Sleuth	79.
Dataform Tech.	
Procomm Plus 1.1	62.
Delrina Technologies	
PerFORM Designer & Filler 2.1	99.
★ PerFORM PRO	279.
Dynamic Microprocessor Assoc.	
pcAnywhere IV	109.
Enable Software	
Enable O/A	429.
Enable BP	119.
Fifth Generation	
Fastback Plus 2.10	115.
Formwork Corp.	
★ Form Publisher for Windows	149.
Fox Software	
Foxbase + 2.1 Network Pack	299.
Foxbase + 2.1 Runtime Module	258.
Foxbase + Dev. System 2.1	196.
FoxPro	469.
Funk Software	
Sideways 3.3	37.
GeoWorks	
GeoWorks Ensemble	109.
Gibson Research	
Spinrite II 1.1	65.
Great American Software	
Money Matters	51.
One-Write Plus Acct. System	165.
hDC Computer Corp.	
★ FirstApps	49.
★ Windows Express	55.
Helix	
Headroom 2.03	72.
NetRoom 1 User	49.
NetRoom 4 User	149.
Hewlett Packard	
★ New Wave 3.0	160.
Hilgraeve	
Hyper Access	125.
Informix	
★ Wingz for Windows/OS/2	329.

MICRO WAREHOUSE™
1690 Oak Street P O Box 1590, Lakewood, N.J. 08701
©1990 Micro Warehouse Inc.

- Visa and Mastercard accepted
- Your credit card will not be charged until your order is shipped
- Purchase orders subject to credit approval
- All products covered by 120 day "hd warranty"
- *Defective software replaced immediately
- Hardware replaced or repaired at our discretion
- CT residents add 8% sales tax. N.J. and Ohio residents add appropriate sales tax
- Orders for in-stock items placed by 7:00 p.m. (E) weekdays, (barring system failure, etc.) ship overnight by Airborne Express. (Some areas require an extra day)
- Shipping charge \$7 per order up to 7 lbs. \$1 per lb. above 7 lbs
- UPS ground service also available upon request - \$3 per order
- UPS orders placed by 3:00p.m. (E) weekdays, ship same day
- Actual freight charges apply for computers, hard disks
- Bernoulli's, tape back ups, monitors and UPS printers
- Alaska, Hawaii outside continental U.S.
- APO/FPO call for information
- Item availability and price subject to change without notice
- Software is not copy protected, except where marked by asterisk
- We reserve the right to limit quantities
- Please indicate disk size



Blackjack
(MicroAce) Learn the strategies of Blackjack at home! Just choose the strategy you wish to master, set the rules and begin to have fun. Evaluates your plays and strategy errors and records them for your review. \$30.



PS/1 Memory
(Computer Elektronik Infosys of America Inc.) Sophisticated software requires more than the base memory available in the PS/1. RAM/I increases your extended memory capacity with 2 MB. Easy to install—just plug it in. \$249.



★ **Access SQL**
(Software Products International) This relational database management system will help managers gain access to information from all sectors of an organization. Full SQL support, low RAM memory requirements, WYSIWYG forms design and much more. \$949.

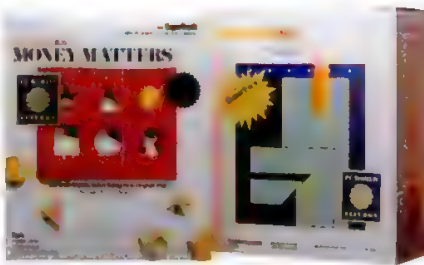


Netroom
(Helix Software) Frees all RAM occupied by LANs, device drivers and TSR's by moving them into extra memory. Netroom is a full featured memory manager and works on 8088 through 486 PCs. \$49. Also 4 user, 10 user and file server license available.



WillPower
(Jacoby & Meyers Law Offices) WillPower makes it easy to write your own will without a lawyer. Includes all standard will provisions plus an on-screen estate valuation worksheet. Not for Louisiana residents. \$29.

NEW!



One-Write Plus Accounting System

(Great American Software, Inc.) The complete accounting system for your small business. Includes General Ledger, Accounts Receivable and Accounts Payable. One-Write Plus is easy to use, set up and is easily customized to fit your business's needs. \$165.

Money Matters

Basic check writing, invoicing and financial reporting for small businesses that operate out of a checkbook. \$51.

Inner Media, Inc.	
★ Wide Angle	85.
Inset Systems	
Hijaak 2.0	Call.
Intuit	
Quicken 4.0	35.
Iris Associates	
★ 3 for 3	79.
Jacoby & Meyers Law Offices	
WillPower	29.
Logitech	
Catchword	148.

Peachtree Software	
Peachtree Complete III	149.
Peachtree Cmpl. III Bonus Bdl	229.
Power Up Software	
Top Priority	58.
Precision Software	
★ Superbase 4 Windows	409.
Prisma Software	
★ Your Way	116.
Prodigy	
Prodigy Start Up Kit	29.
Que Software	
RightWriter 4.0	55.

System Sleuth Pro/★ Win Sleuth

(Dariana Technology) System Sleuth Pro is a system analysis and reporting tool with new diagnostic powers. System Sleuth Pro features tests for system boards, RAM, hard and floppy disks, video systems and ports. \$73. Purchase System Sleuth Analyzer (formerly System Sleuth 2.1) at a special new price \$39. Win Sleuth 1.0, diagnostic software for Windows 3.0. \$79.



UPDATE!

Lotus	
Agenda 2.0	289.
Lotus 1-2-3 Rel. 2.2	339.
★ Lotus 1-2-3 Rel. 3.1	419.
Lotus Works 1.0	109.
Magellan 2.0	109.
Symphony 2.2	519.
Meca	
Home Lawyer	72.
Managing Your Money 7.0	122.
Merrill & Bryan	
★ Turbo EMS 5.0	56.
Microcom	
Carbon Copy Plus 5.22	115.
Virex PC	72.
Micro Logic	
InfoSelect	53.
Microsoft	
★ Excel for Windows 2.1C	309.
★ Productivity Pack	42.
★ Project for Windows 1.0	449.
★ Windows 3.0	88.
★ Windows Developer's Tool Kit	325.
Word 5.5	205.
★ Word for Windows 1.1	309.
Works 2.0	95.
Multisoft	
PC-Kwik Power Pak 1.5	75.
NBI, Inc.	
★ Legacy	298.
New England Software	
Graph-in-the-Box Exec.	159.
Nolo Press	
Willmaker 4.0	36.
Norton Lambert	
Close Up Customer/Terminal	119.
Close Up Support/ASC 3.0	154.
Okna Corporation	
★ Desk Top Set	85.
PC Publishing	
Impress 2.0	74.

OMS	
★ Ultrascript PC 2.1	119.
★ Ultrascript PC Plus 2.1	249.
Qualitas	
386Max Professional	75.
Quarterdeck Office Sys.	
DESQview 2.3	69.
DESQview 386 5.1	119.
QEMM 50/60 5.1	59.
★ QEMM 386 5.1	55.
QRAM	45.
Reality Technologies	
Wealthbuilder 1.1 (by MoneyMag.)	145.
WealthStarter	49.
Reference Software	
Grammatik IV 1.0	49.
★ Grammatik Windows	49.
Samna	
★ Ami Professional 1.2	305.
Sitka	
TOPS Flash Card	148.

Softlogic Solutions	
Disk Optimizer 4.05	39.
Software Carousel 3.01	55.
Software Directions	
★ Print Q 5.0	83.
PrintQ LAN	259.
Software Products International	
★ Access SQL	949.
Open Access	425.
Software Publishing	
Professional Write 2.2	169.
Spinnaker Software	
BetterWorking Eight-In-One	37.
The Resume Kit	29.
Symantec	
Norton AntiVirus	88.
Norton Commander 3.0	99.
Norton Util. Advanced 5.0	109.
The Norton Backup 1.0	99.
Timeline 4.0	472.
ThreadZ Software Design Group Inc.	
★ ThreadZ File F/X	75.
Timeslips Corp.	
Timeslips III 4.0	169.
Touchstone	
Check It! 2.1	85.
Traveling Software	
Laplink III	89.
TriSoft	
★ Whereabouts Deluxe	59.
Vertisoft	
Double Disk	65.
Volkswriter	
Total Word	209.
West Lake Data	
Pathfinder Plus	76.
WordPerfect Corp.	
WordPerfect 5.1	249.
WordScience	
Definitions Plus	69.
WordStar U.S.A.	
WordStar 6.0	256.
XTree Company	
XTree Pro Gold	79.
Zenographics	
Superprint for HP Laser	119.

TAX SOFTWARE

Chipssoft	
Turbo Tax Personal 1040 8.0	39.
DacEasy Inc.	
Sylvia Porter's Rapid Tax	42.
MECA	
TaxCut	49.
Simon & Schuster	
J.K. Lasser Tax Advantage 1990	25.
Softview	
★ MacInTax for Windows	59.

LANGUAGES

Asymetrix	
★ Toolbook	299.
Borland International	
Turbo C++	135.
Turbo C Prof. ++	170.
Turbo Pascal 5.5	98.
Microsoft	
C Compiler 6.0	319.
QuickC 2.5	69.
Nantucket	
Clipper 5.0	499.
Solution Systems	
Brief 3.0 for DOS/OS/2	179/159.
Spinnaker Software	
★ Spinnaker Plus	285.

PC Globe PC USA



PC Globe 4.0 & PC USA 2.0

(PC Globe) The indispensable "electronic atlas" that provides instant profiles of 190 countries. Detailed maps, graphics, facts and figures allow for quick cross-comparisons of countries for a wide variety of data, which can be exported to other programs. Updated and enhanced. \$36. Also available, **PC USA** with detailed data on all 50 states. \$36.

eral handy little utilities. *Big Cursor*, for instance, is a free program by James Cuddy (available on PC MagNet) that doubles the size of the mouse pointer when the cursor is in pointer mode so that it's easier for you to find. It requires roughly 10K of RAM.

Whiskers is an elegant \$15 shareware utility from Numbers & Co. that allows you to assign key combinations to the right and middle mouse buttons. It's most useful for the ability to make the right button equivalent to pressing the Enter key; this lets you confirm the defaults in dialog boxes without moving the mouse. You can also assign the Shift button, and make pressing both mouse buttons equivalent to pressing the middle button on a three-button mouse. For the rare program that, like *PageMaker*, uses the right mouse button, you can configure *Whiskers* to be inactive inside specified programs. It takes about 30K RAM.



Whiskers

Numbers & Co., Route 1, Box 59A,
Oroville, WA 98844; 509-476-2216.

List Price: \$15.

CIRCLE 621 ON READER SERVICE CARD

MACRO UTILITIES

by M. David Stone

Although *Microsoft Windows* comes with plenty of features for customizing its interface, it's sorely lacking in options for customizing commands and menus. For that, you need a keyboard or macro utility. These can range from simple programs that record a series of keystrokes and play them back just as if you typed them at the keyboard, to full-fledged batch languages, which can be indistinguishable from full-scale programming languages.

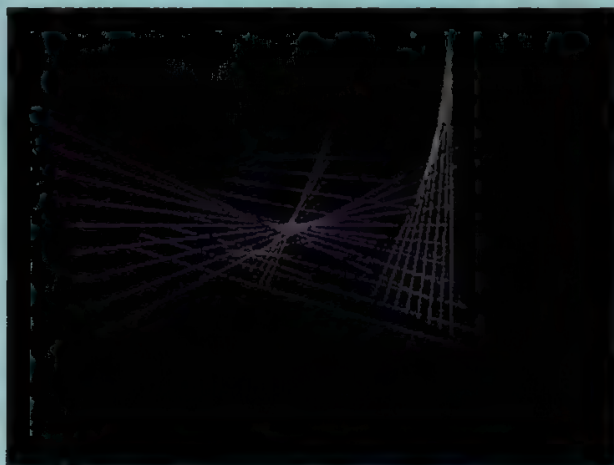
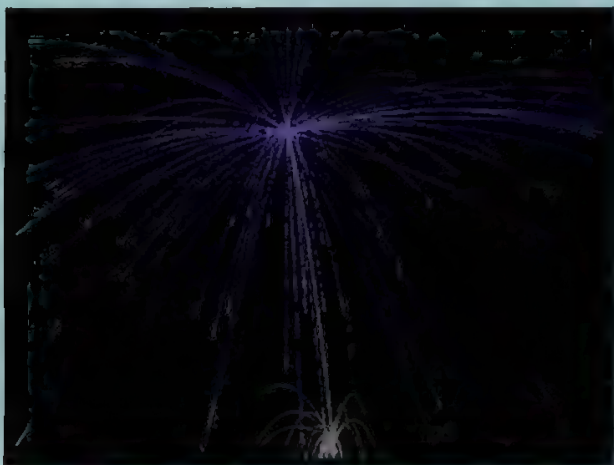
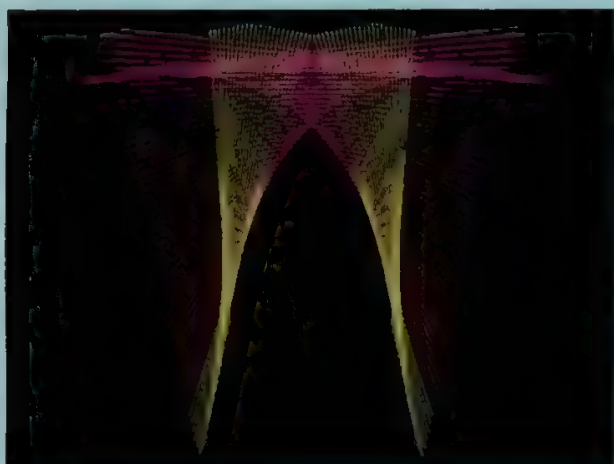
Windows does offer a simple macro utility called Recorder, but for anyone who has written DOS batch files or used a full-fledged DOS macro program like *SuperKey* or *Keyworks*, Recorder is pitifully underpowered. It records keystrokes (and optionally,

mouse movements) as you enter them. You can then attach that recording to a hotkey combination for playback on demand. You can also designate any macro

Although *Microsoft Windows* comes with plenty of features for customizing its interface, the program is sorely lacking in options for customizing commands and menus.

as applying to all programs or to just the one it was recorded in.

But Recorder suffers from serious limitations: it offers no way to edit a macro once learned, and its macros don't work with non-*Windows* programs. Also, if you designate a macro for one application, Recorder will not let you use the same key for some other application unless you save the two macros in separate files. Different macro files for different appli-



Windows 3.0 screen blankers give you a wide choice of attractive animated displays, including *Microsoft Entertainment Pack's* dancing lines, *Magic's* striking mobile patterns, and *Intermission's* spectacular fireworks.

A FULL 32-BIT 386 LAPTOP FOR LESS

WHY PAY MORE FOR AN SX?



LP/320 \$2,650
20MHz/LCD VGA/1MB/43MB HD

LP/325 \$3,495
25MHz/LCD VGA/1MB/43MB HD

**INFO
WORLD**

"Bustin' Out"
Sept 3, 1990

FREE TRW
On-Site Service

Recently, the editors at InfoWorld magazine compared our new portable laptop LP-320 (setup value \$3,025) to Compaq's Portable 386 (setup value \$8,997) and Toshiba's T5200 (setup value \$8,497). Here's some of what InfoWorld said.

- 1) Speed: "Dataworld's disk-intensive total was the best"
- 2) Screen: "VGA-compatible screen that has a dark-and-bold font that is unusually sharp."
- 3) Battery: "No other system in this comparison (Compaq nor Toshiba) supports a battery."
- 4) Support: "Helpful technicians who accurately answered our questions."
- 5) Value: "The Dataworld system is a great value. This is a solid buy."

WE'RE OPEN MONDAY THRU FRIDAY FROM 6AM TO 6PM
AND ON SATURDAY FROM 9AM TILL 3PM PACIFIC TIME

All DataWorld Sales Are Backed By
**30-DAY MONEY-BACK
SATISFACTION GUARANTEE**

If you're not satisfied with your purchase return it within
30 days for a full refund (excludes shipping charges)

All DataWorld Systems Are Protected

**1-YEAR WARRANTY ON PARTS & LABOR
WITH LIFETIME TOLL-FREE TECH SUPPORT**

Corporate/Government purchase orders accepted upon approved credit

This is a full 32-bit system with an Intel 386 processor running at 20MHz. So it's much faster than the slower SX.

The LP/320 uses the sharpest LCD VGA super-twist screen, DRAM that's expandable to 8MB and a Conner 43MB hard drive.

And, because we believe the concept of a laptop demands portability we added a built-in rechargeable battery, so you can take it anywhere.

Of course, with a laptop this good you'd expect it to be the most expensive. It's not.

While the Compaq Portable 386 and Toshiba T5200 are priced over \$8,000 each you can have the LP-320 for \$2,650!

LP320 Laptop Standard Features

- Intel 386DX 32-bit 20MHz CPU
- LCD VGA Super-Twist Screen 640 x 480
- 1MB DRAM (upgrade to 8MB)
- Conner 43MB IDE High-Speed Hard Drive & Controller Card
- 80387 & 80287 Support
- 3.5" 1.44MB floppy
- Sleep Mode to Conserve Battery Power
- 1 parallel, 2 serial ports
- Separate 10-Key Numeric Keypad
- 1 Expansion Slot
- AC Adapter
- Carrying Bag
- FastLynx Laptop-to-PC Software & Cables Kit

LP320 Laptop Optional Features

- Conners 100MB or 200MB Hard Drive
- Matsushita or NEC Full-Size VGA Monitor
- Math Coprocessor Intel or IIT
- 20MB To 500MB External Tape Back-Up
- Mouse
- Fax/Modem or Network Card
- 5.25" External Floppy

1-800-736-3282

In California call (213) 695-3777
Fax: (213) 695-7016

DATA
DATAWORLD

3733 San Gabriel River Parkway
Pico Rivera, CA 90660-1404

PC
MAGAZINE

PC
MAGAZINE
EDITORS' CHOICE

PC
MAGAZINE
EDITORS' CHOICE

PC
MAGAZINE
EDITORS' CHOICE

PC
MAGAZINE
EDITORS' CHOICE

cation, Recorder will not let you use the same key for some other application, unless you save the two macros in separate files. Different macro files for different applications makes sense in DOS, yet they make no sense at all in a multitasking environment like *Windows*.

Fortunately, you have other options. Softbridge's *Bridge Tool Kit* and Publishing Technologies' *PubTech BatchWorks* offer full-fledged macro languages for *Windows*, while Affinity Microsystems' *Tempo For Windows* offers only keystroke macros, but with more useful features than Recorder. Tying all these products together are each program's customizable commands (and in some cases menus), so that your computer works more like you do.



SOFTBRIDGE INC. **Bridge Tool Kit**

Written by Softbridge, the same company that wrote the *Windows* Recorder utility, *Bridge Tool Kit*, priced at \$695, is the most ambitious and certainly the best realized of the keyboard and macro programs. *Bridge* offers many of the features you'll find in *PubTech BatchWorks*. In particular, it is based on an extensive batch language and includes commands that let you easily create and modify menus and dialog boxes. Yet *Bridge* follows a different design than *BatchWorks* and goes far beyond it in many ways.

Bridge programs consist of ASCII files, so you can create a program with virtually any text editor. If you use *Bridge*'s built-in Editor, however, you can interactively debug your *Bridge* programs. You can run the program directly from the menu by choosing File Run, and if *Bridge* trips across a problem, it will give you an error message complete with the line number. You can then go to that line in the file, correct your code, and immediately run the program again. Not surprisingly, given this approach, you won't find a learn mode in *Bridge*. However, Softbridge says that one will be added to Version 3.0, which should be available by the time you read this.

The syntax and structure of a *Bridge* program or batch file is similar in many ways to a DOS batch file. However, *Bridge* offers more commands than you'll find in DOS batch files and covers a wider range. The total count is more than 125 state-

ments and functions, including commands for branching, looping, file handling, and string handling. You'll also find *Windows*-specific commands such as Maximize, Minimize, and Move window, and a set of commands for defining dialog boxes, pull-down menus, and even cascading menus.

Unlike *BatchWorks*, which automatically attaches your custom-designed menus to *Windows* programs, *Bridge* makes its custom menus available only in the *Bridge* window. Although you can build menus that are available within specific programs, the procedure is clumsy. Briefly, you have to define a hotkey that will take you to the *Bridge* window, and define the *Bridge* menu so it will take you back to the program you were in. The result leaves you jumping from window to window and is more than a little distracting.

The preferred approach to controlling a program in *Bridge* is to use a hotkey directly. The hotkey can be a function key, but will more typically be an alpha or numeric key plus the Ctrl or Alt keys. The hotkey is defined in the batch file, using an On Key statement. One particularly nice touch is that you can define any given hotkey to apply to all *Windows* programs, or to a specific program only. You can even define the same hotkey to apply differently to different programs.

Another noteworthy feature in *Bridge* is that, unlike the other programs reviewed here, it can pass information between DOS and *Windows* programs. When running *Windows* in 386 enhanced mode, *Bridge* can read text from a DOS screen, send keystrokes as input to DOS applications,

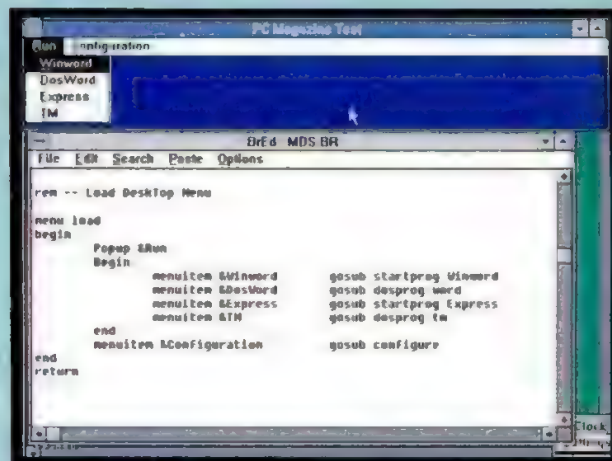
and create hotkeys for DOS. This makes *Bridge* the only program reviewed here that will let you hotkey your way back from a DOS window directly to a *Windows* program.

The *Bridge* manuals get high marks overall. You'll find a command reference complete with examples and an excellent introduction to programming with *Bridge* batch files. However, there are some glaring oversights. In particular, the manual

**With the *Bridge*
Tool Kit you can
easily create and
modify menus and
dialog boxes.**

only hints at how to call up a DOS window with *Bridge* so you can hotkey back to a *Windows* program. This oversight would be forgivable if the company could supply a clear explanation by phone, but a lengthy call to Softbridge failed to produce one. What should have been a simple procedure ended up taking several hours of trial and error. Furthermore, technical support isn't even a free call.

Still, if Softbridge can be faulted for less-than-perfect support, it should be praised for writing a language that does more than even its makers realize. As part of our tests, we tried to create two-key macros to allow a greater range of mnemonic hotkeys—Ctrl-W-W to start *Word* for *Windows*, for example. According to



***Bridge Tool Kit* offers a robust macro language that lets you create complex scripts that automate your *Windows* operations. Its capabilities include the ability to define your own pull-down menus.**

THE COMPETITION CAN'T TOUCH THIS

MAIN SYSTEM BOARDS BY intel®



386/25intel \$2,989
25MHz/64K CACHE/SUPER VGA/4MB/100MB HD

386/33intel \$3,234
33MHz/64K CACHE/SUPER VGA/4MB/100MB HD

386/25 \$2,634
25MHz/SUPER VGA/4MB/100MB HD

This system comes with our own advanced system board and does not include cache memory. Otherwise, it has all the same features and components of our 386/25intel.

486/25 \$3,959
25MHz/8K CACHE/SUPER VGA/4MB/100MB HD

486 Don't settle for anything less! This system is designed around our own 486 board and an incredibly fast Intel 486 microprocessor with a built-in 8K cache.

Why pay more for a standard 386SX 16-bit machine with a no-name main system board when you can have a much faster, more reliable, full 32-bit 386 system with a genuine Intel main system board and CPU for the same price or less?

We add only the best components too, like Conner hard drives with capacities up to 200MB, TEAC floppies, Orchid Super VGA adapter cards (no cheap imitations here!) and the top line Matsushita or optional NEC monitors.

They can't touch that!

FREE TRW
On-Site Service

intel®
system board

386/25MHz & 386/33MHz Unique Features

- 4MB High Speed DRAM (upgrade to 40MB ideal for UNIX applications)
- 64K Cache
- Full 32-bit Intel made system board

486/25MHz Unique Features

- Intel 486 microprocessor with built-in 8K Cache
- 4MB High Speed DRAM (upgrade to 16MB)
- Weitek 4167 Support

Desktop 386 & 486 Standard Features

- Conner 100MB IDE Hard Drive & Controller Card
- Super VGA Color Monitor 14"

1024 × 768

- 16-bit Orchid Adapter with 512K (up to 1MB)
- 1.2 and 1.44 Floppies
- LIMS EMS 4.0 Drivers
- 101-Key Enhanced Keyboard
- 2 Serial/1 Parallel Ports
- 2-32 or 16, 5-16 & 1-8 bit Expansion Slots
- 80387 or Weitek support
- FCC Class B Certification

Desktop 386 & 486 Optional Features

- Conners/Micropolis Hard Drives in IDE or ESDI formats Up To 600MB
- NEC Monitors
- 120MB To 500MB Tape Back-Up
- Fax/Modem
- 128 Secondary Cache (486 Only)

PC Sources

JAN 1991

"IT'S A WINNING COMBINATION."

Why pay the same price for an ordinary slower standard 486? If you crave the very best and latest technology, but still demand great value, this is your perfect buy.

1-800-736-3282

In California call (213) 695-3777
Fax: (213) 695-7016

DATA
DATAWORLD

3733 San Gabriel River Parkway
Pico Rivera, CA 90660-1404

WE'RE OPEN MONDAY THRU FRIDAY FROM 6AM TO 6PM
AND ON SATURDAY FROM 9AM TILL 3PM PACIFIC TIME

All DataWorld Sales Are Backed By
**30-DAY MONEY-BACK
SATISFACTION GUARANTEE**

If you're not satisfied with your purchase return it within
30 days for a full refund (excludes shipping charges)

All DataWorld Systems Are Protected

**1-YEAR WARRANTY ON PARTS & LABOR
WITH LIFETIME TOLL-FREE TECH SUPPORT**



Corporate/Government purchase orders accepted upon approved credit

PC
MAGAZINE

Endurance Tests Data
386/25A—Jan 16, 1990

PC
MAGAZINE

EDITORS'
CHOICE

Date 386/25
May 30, 1989

PC
MAGAZINE

EDITORS'
CHOICE

Date 386/25

PC
MAGAZINE

EDITORS'
CHOICE

Date 386/25
Feb 25, 1990

PC
MAGAZINE

EDITORS'
CHOICE

Portacom II
Oct 11, 1988

Softbridge, this particular trick shouldn't work because the program can't nest subroutines. With a little experimentation, however, we managed to produce two-key and even three-key macros anyway. The point is that the *Bridge* language is flexible enough to qualify as a true programming language. And though there are limitations, you'll also find ways around them.

At \$695 for the complete package

FACT FILE EDITORS' CHOICE

Bridge Tool Kit

Softbridge Inc., 125
Cambridge Park Dr.,
Cambridge, MA
02140; 800-955-
9190, 617-576-2257.

List Price: *Bridge*
Tool Kit, \$695.

Bridge Batch, \$179.

Requires: 1MB
RAM, hard disk,
EGA or VGA graphics adapter, *Microsoft*
Windows 3.0, DOS 3.1 or later. Mouse
recommended.

In Short: Big, complex, and powerful, this
richly featured programming language can
automate just about any *Windows* task.

CIRCLE 622 ON READER SERVICE CARD

Pubtech

BatchWorks

Publishing
Technologies Inc.,
7719 Wood Hollow
Dr., #260, Austin, TX
78731; 800 782-
8324, 512-346-2835.

List Price: \$99.95

Requires: 1MB RAM,
hard disk, EGA or
VGA graphics adapter, *Microsoft Windows*
3.0, DOS 3.1 or later. Mouse recommended.

In Short: Intelligent design and the flexibility of
both keystroke macros and a batch language
are marred by inadequate documentation and
a few bugs.

CIRCLE 623 ON READER SERVICE CARD

Tempo For Windows

Affinity Microsystems
Ltd., 1050 Walnut
St., #425, Boulder,
CO 80302; 800-367-
6771, 303-442-4840.

List Price: \$99.95.

Requires: 1MB
RAM, hard disk,
EGA or VGA graphics adapter, *Microsoft*
Windows 3.0, DOS 3.1 or later. Mouse
recommended.

In Short: This keystroke macro recorder offers
few features that Recorder doesn't, and has a
few bugs.

CIRCLE 624 ON READER SERVICE CARD



(which will include a license for three runtime versions by the time you read this), and \$79 for additional runtime versions, *Bridge Tool Kit* is not the answer for everyone. In fact, at press time Softbridge announced a less expensive companion called *Bridge Batch*. While it does not support the integration of DOS applications and can't create encrypted batch files that can be distributed in runtime versions, at \$179 it's likely to be more suitable for most individual users. But if you need a customized interface, and particularly if you need to integrate standard DOS programs into the *Windows* environment, *Bridge Tool Kit* is the only game in town.



PUBLISHING TECHNOLOGIES INC. Pubtech BatchWorks

Pubtech BatchWorks from Publishing Technologies is an ambitious \$99.95 package that includes a macro learn mode, an extensive batch language, and the ability to easily create and modify menus and dialog boxes for *Windows* programs. But the package is flawed by a poorly designed manual and by a troublesome incompatibility with *Word for Windows*.

BatchWorks takes a modular approach to macro creation. Each macro gets its own file, and so does each menu and dialog box. You can create simple keystroke macros through the program's learn mode or by creating an ASCII file with any text editor. For complex macros, as well as dialog boxes and menus, typing the commands into an ASCII file is the only choice.

Macro files are written in the *BatchWorks* language, which includes about 85 statements. There are commands for branching, file handling, and string handling, as well as commands for *Windows*-specific needs, such as dialog box control.

Dialog box files are basically text-based representations of the dialog box itself. Menu files consist of macro names along with a menu description, a shortcut key, or both. If you leave out the menu descriptions, the macro choice will not show on the menu. If you leave out the shortcut keys, you won't be able to run the macro except from a menu. The menu attaches to the system menu in any active

window and works like any other *Windows* menu.

BatchWorks recognizes a single global menu that it shows no matter where you are in *Windows*. However, you can also create menus for specific programs by naming each menu to match the program it goes with. *BatchWorks* will then display the appropriate menu for each program along with the global menu.

An interesting touch is that *BatchWorks* lets you create so-called batch files. These are identical to macro files, except that you can start a batch file directly from an icon or from the file manager. The batch files serve the same function as a .BAT file in DOS.

Unfortunately, few of these features are explained well in the manual. And just to make things more confusing, the manual shows different menus than the ones shipped with the program. Technical support makes up for the manual. Expect to spend time on the phone to learn what the manual should have explained in the first place. And expect to spend money too; the call to technical support is not toll-free.

As mentioned, *BatchWorks* has problems with *Word for Windows*, with the macro playing back three times instead of once each time you call on it. The problem did not show up in any other program tested with *BatchWorks*, but it was unusable with *Word for Windows*. Publishing Technologies says it is currently working on the problem.

For the most part, *BatchWorks* deserves praise for intelligent design. And except for the problems with *Word*, most faults can be cured by a thorough rewrite of the manual. Version 1.03b leaves room for improvement, so keep an eye out for future upgrades.



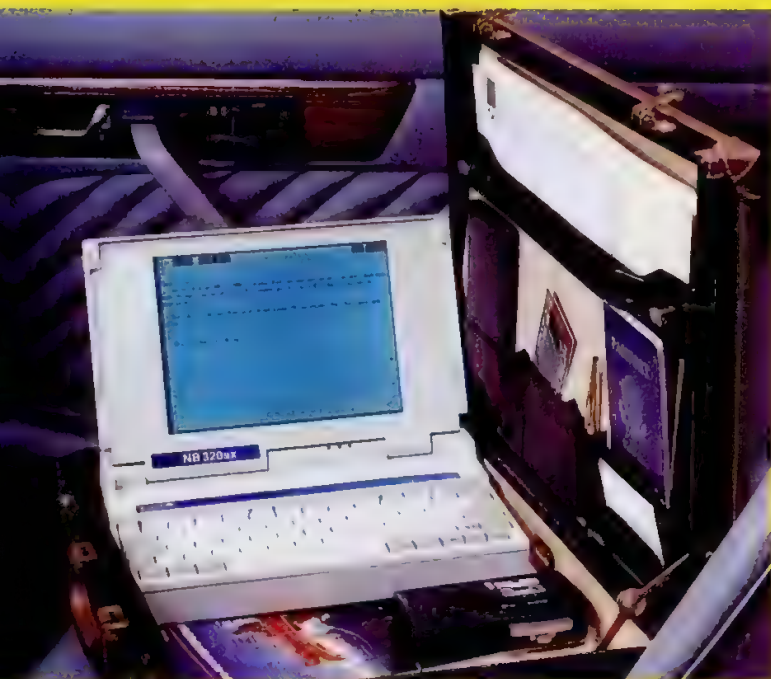
AFFINITY MICROSYSTEMS LTD. Tempo For Windows

If batch file programming is more than you want to bother with, and the Recorder utility isn't enough, your remaining choice is *Tempo For Windows*. This \$99.95 program offers only a few more features than Recorder, but they may be just the features you need.

Like Recorder, *Tempo* is limited to creating macros through a learn mode, and it will optionally record mouse move-

386SX NOTEBOOKS THAT PERFORM LIKE DESKTOPS

FOR THE SAME PRICE OR LESS THAN 286 NOTEBOOKS



NB/320SX \$2,650
20MHz/LCD VGA/2MB/20MB HD

NB/320SX PLUS \$2,850
20MHz/LCD VGA/4MB/20MB HD

NB/320SX SUPER \$2,995
20MHz/LCD VGA/4MB/20MB HD/MODEM

NB/320SX Notebook Standard Features

- Intel 386SX 20MHz CPU
- LCD VGA Back-lit Super Twist Screen 640 x 480
- Power Management Chipset
- High-Speed 20MB Hard Drive
- 80387SX Coprocessor Support
- 3.5" 1.44MB floppy
- Sleep Mode Conserves Battery Power While System Is On

- Suspend Mode To Halt And Later Resume Work
- 1 parallel, 2 serial ports
- 80-Key Keyboard
- 12 Function Keys
- Special Large Enter Key
- Connector For External 101 or PS2 Full-Size Keyboard
- Video Port For Full-Size VGA Monitor
- Uses Rechargeable D size Batteries

- 3 To 4 Hours Operation
- FastLynx Notebook-to-PC Software & Cables
- Only 6.5 Pounds
- Size: 8.5" x 11" x 2"
- MS-DOS 4.01

**OPTIONAL 24 HOUR
MAINTENANCE PLAN**

NB/320SX Notebook Optional Features

- Matsushita or NEC Full-Size VGA Monitor
- 80387SX Math Coprocessor
- Mouse
- Internal Fax/Modem
- 3 Slot Expansion Box
- Automobile Power Adapter
- Leather Carrying Bag
- Second Battery With Charger

ASK ABOUT WINDOWS 3.0 & MOUSE

WE'RE OPEN MONDAY THRU FRIDAY FROM 6AM TO 6PM
AND ON SATURDAY FROM 9AM TILL 3PM PACIFIC TIME

All DataWorld Sales Are Backed By

**30-DAY MONEY-BACK
SATISFACTION GUARANTEE**

If you're not satisfied with your purchase return it within
30 days for a full refund (excludes shipping charges)

All DataWorld Systems Are Protected

**1-YEAR WARRANTY ON PARTS & LABOR
WITH LIFETIME TOLL-FREE TECH SUPPORT**

Corporate/Government purchase orders accepted upon approved credit

They're here!

Notebook size 386SX systems that can perform as well as most desktops, even though they weigh only 6.5 pounds and fit into a corner of your briefcase. But, don't confuse them with those wimpy 286 notebooks.

This is the real thing! Powerful 386 20MHz performance with up to 4MB DRAM, LCD back-lit VGA screen, built-in hard drive and floppy, 12 function keys, large enter key, and even optional modem/fax and mouse.

And all three of these notebook models offer a special "suspend mode" that let's you turn off the system and later return to your work exactly where you left off without rebooting.

Run them on their own rechargeable battery pack, or 4 rechargeable D size batteries that you can buy just about anywhere.

At the office you can add an optional expansion box with three extra slots and connect our notebook to your office LAN. Or add a full-sized VGA screen or any full-sized keyboard.

You're looking at a high-performance take-anywhere PC system!—anything else is a toy.

1-800-736-3282

In California call (213) 695-3777

Fax: (213) 695-7016

DATA
DATAWORLD

3733 San Gabriel River Parkway
Pico Rivera, CA 90660-1404

PC
MAGAZINE

PC
MAGAZINE
EDITORS'
CHOICE

PC
MAGAZINE
EDITORS'
CHOICE

PC
MAGAZINE
EDITORS'
CHOICE

PC
MAGAZINE
EDITORS'
CHOICE

NOW WITH
WINDOWS 3.0

THE BRICK™

Designed for the Way you Always Wanted to do Computing

Customers and critics alike are praising the Brick for its portability, elegant design, whisper quiet operation and screamingly fast power. Find out for yourself why this diminutive PC with the unforgettable name is making its way onto the desktops of the most demanding power users.

More Practical Than a Portable

For multisite computing, the Brick offers an alternative to the usual trade-offs of laptops or multiple PC's. Just keep your preferred keyboard and full size monitor, plus power supply at your regular destination and carry only the 8 lb. Brick in between. You'll save half the cost, half the weight and all the hassle of coordinating files between multiple machines.

Blazingly Fast

Compared to published reports of all 386SX machines tested to date by *PC Magazine*, the Brick offers superior performance on the aggregate of

TIME IN SECONDS
0 40 80 120 160



*Brick with 16MB RAM, 212MHz HD
The lower number is better.

Time to complete PC Magazine's full benchmark test set.



BRICK & WINDOWS SPECIAL \$2,495

Windows 3.0
with the hottest Windows add-ons
4MB of RAM
44MB Hard Disk
2,400bps Modem
1024 x 768 VGA Graphics
Adobe's ATM
QEMM 5.1
Logitech Mouse

SAVE \$881

"The Brick is... a great personal computer in every respect. It takes up minimal desk space, it's both rugged and stylish, and it's extremely fast."

Bill Machrone, PC Magazine, 1/91



Fits in half a briefcase, leaving room for full-sized folders, notebooks, etc.

system, video and hard disk benchmarks.

Massive Hard Disk

Bricks are available with 16 or 20 MHz 386SX, 1-8 MB of RAM, a fast 44, 104 or 212 MB Conner or Teac IDE hard disk, and a 387 coprocessor socket. A 2,400 bps Hayes compatible modem is standard.

"A whole new slant on portable computing... exceptionally ingenious."

Portable Office

12/90, Eric Grevstad

"Recommended."

Jerry Pourmelle **Byte**, 1/91,

The fast VGA graphics feature up to 1024 x 768 non interlaced resolution with a full 1 MB of video memory. In fact, the Brick's video performance is twice as

fast as the average of 42 386SX systems tested to date by **PC Magazine!**

Surprisingly Expandable

The Brick is only about the size of a ream of copier paper, yet you can still add up to two ISA half cards internally, (one card with a floppy drive). A docking

"A Tote-able That Outperforms the Desktops."
PC Magazine
9/90, Matt Ross



port allows easy, drop-in connection to our Docking Terminal, \$349, which instantly hooks up all cables and provides another 16-bit 3/4 length slot. The "Stretch" version of the Brick accommodates full length cards.

Brick & Windows Hot Special

It takes more than just software and a mouse to make a satisfying Windows

machine. Our Brick & Windows Special comes with 4MB of RAM (not 2 as others provide), Windows 3.0, DOS, and a

Logitech mouse with our hot 16 MHz 386SX Brick. You also get two award winning programs that are essential to fulfilling the promise of Windows. Adobe's wonderful Type Manager (ATM) with 13 fonts for true WYSIWYG display and high quality printed documents and Quarterdeck's QEMM 5.1 memory manager for running Windows on a network.

No other 386SX matches the Brick's graphics processing power, storage capacity, quietness and versatility. And while others give you Windows, we give you what it takes to make Windows 3.0 really perform.

\$2,495

Brick & Windows Special includes:

- ▲ 16 MHz Intel 386SX
- ▲ 4MB RAM
- ▲ 44MB 28ms hard disk
- ▲ 1024 x 768 VGA adapter
- ▲ 2,400 bps modem
- ▲ 3.5" floppy
- ▲ 16-bit half card exp. slot
- ▲ 1 parallel, 2 serial ports
- ▲ Windows 3.0 and DOS
- ▲ QEMM 5.1
- ▲ Adobe Type Manager
- ▲ Logitech Mouse
- ▲ All software completely set up. Ready to go.

Options:

- ▲ 104MB add \$395
- ▲ 212MB add \$995
- ▲ 20MHz Brick add \$250
- ▲ 8MB RAM add \$396
- ▲ 12" mono VGA monitor & 101 keyboard add \$218
- ▲ 14" color VGA 640 x 480 monitor & 101 keyboard add \$464
- ▲ Freight prepaid.

Save **\$881** off 1990 catalogue prices

Offer expires 3/31/91

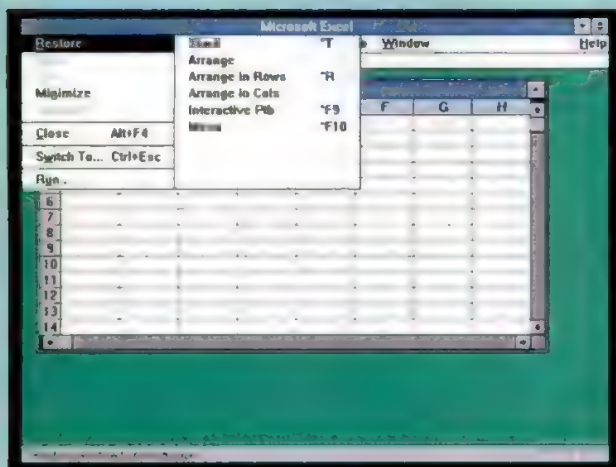
One Intercontinental Way, Peabody, MA 01960
Tel: (508) 535-7510 Fax: (508) 535-7512
CIRCLE 479 ON READER SERVICE CARD

COMPUTING

**CALL TOLL FREE 1-800-633-1925
OR FAX AUTOMATICALLY 24 HRS
1-800-THE-BRICK**



ADDITIONAL MACRO UTILITIES



Pubtech BatchWorks lets you attach macros as menu entries on the system menu of any Windows program, such as *Microsoft Excel*. You can also attach macros to hotkey combinations.

If your needs don't require a replacement for *Recorder*, perhaps you should consider a few shareware utilities that let you supplement its modest powers. *Recorder Run*, for instance, lets you attach *Recorder* macros to icons in the Program Manager so that you can execute them simply by double-clicking. If you're hooked on icons, you should find *Recorder Run* worth the trouble of downloading from CompuServe or your favorite bulletin board system; its shareware price is a hardly noticeable \$10.

Another handy shareware utility is *Hotkeys* (\$20). *Hotkeys* takes exactly the opposite route from *Recorder Run* by letting you assign hotkeys for launching or switching to Windows applications, and for executing common commands like Minimize or exit in a single keystroke. The key definitions are somewhat more versatile than the ones that *Windows* alone offers in 386 enhanced mode (which you set up using the Advanced .PIF Options)—you can use any combination of Alt, Ctrl, or Shift keys plus a letter or number key. What's missing is any way to define two-key macros (such as Ctrl-W-W), so you can quickly run out of good mnemonic combinations.

Finally, if you're running *Windows* on a network, you should know that *Windows Workstation* offers a batch language called Multiset. This is designed to duplicate the capabilities in network log-in scripts, and offers some specialized capabilities to serve this function (notably, the ability to set environment variables and to modify the WIN.INI and SYSTEM.INI

ments as well as keystrokes. But, like *Recorder*, *Tempo* doesn't let you edit the macros in any way once you've created them. However, *Tempo* adds three important features that give it a significant edge.

Arguably, *Tempo*'s most important advantage is the ability to assign the same key to different macros in different applications. You can even use a given hotkey for a global macro and override it with a program-specific macro in a given application. This not only gives you more flexibility in assigning hotkeys, it lets you create a larger number of mnemonic hotkeys and fewer arbitrary ones.

A second advantage over *Recorder* is that *Tempo* lets you hook macros together with menu-driven options for branching and looping among macros. If you're comfortable with programming these steps, the menus may actually be more confusing than writing the commands yourself, but they do the job. A last advantage of *Tempo* is a special command for launching or switching to applications.

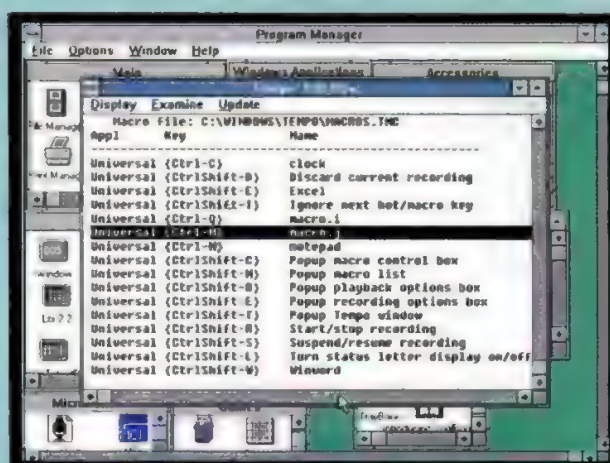
Unfortunately, our tests revealed some problems with *Tempo*. Most are minor but annoying. For example, if you try to record a macro to launch a DOS program, *Tempo* opens the DOS window, but gives a "probably out of memory" error message. If you play the macro back later, it gives the same message.

A more important problem is that if you go into *Excel* and then *Word* for *Windows* with *Tempo*'s command for launching applications, the system locks up. This problem is peculiar to *Word*, and only shows up if you launch the programs in this specific order. Affinity Microsys-

tems realizes these problems and hopes to fix them by the time this is published. For the moment, however, the program is clearly less stable than it should be. As

Tempo For Windows
lets you assign the
same key to different
macros in different
applications.

with *BatchWorks*, *Tempo*, Version 1.2, gets filed under "room for improvement." But keep an eye out for future upgrades.



Tempo For Windows' file viewer lets you list the macros you record, but you cannot edit them.

dTruth Comes Out.

Software Digest **RATINGS REPORT**
 Volume 7 Number 13
 The Independent Comparative Ratings Report for Selecting IBM PC Business Software

MULTIUSER DATABASE PROGRAMS

Ratings Key: ■ 70-100 ■ 50-69 ■ under 50

Software Digest Rating	Overall Evaluation	Overall Power	Program Name	Version Tested	Performance	Versatility	Error Handling	Ease of Learning	Ease of Use	Memory Requirement	Price	Volume Purchase Agreement	Page
***	70	67	dBase IV	1.1	■	■	■	■	■	450KB	\$795	✓	28
**	6.8	51	Paradox	3.5	■	■	■	■	■	640KB	\$995	✓	32
**	6.8	71	FoxPro/LAN	1.02	■	■	■	■	■	512KB	\$1,095	✓	30
**	6.4	51	DataEase	4.2	■	■	■	■	■	640KB	\$750	✓	26
*	5.8	3.6	RtBase	3.0	■	■	■	■	■	520KB	\$995	✓	34
*	5.7	6.0	Clarion Professional Developer	2.1	■	■	■	■	■	512KB	\$845	✓	24
*	5.7	6.6	Advanced Revelation	2.01	■	■	■	■	■	640KB	\$995	✓	22

REPRODUCTION OR QUOTATION, IN WHOLE OR IN PART, IS PROHIBITED WITHOUT PRIOR WRITTEN PERMISSION.
 All rights reserved. © 1990 by ASHTON-TATE, Inc. Plymouth Corporate Center, Plymouth Meeting, PA 19062. 800-223-7000

The new dBASE IV® version 1.1 has been rated the #1 Multiuser Database by Software Digest Ratings Report (Volume 7 Number 3, October, 1990).

Because Software Digest accepts no advertising whatsoever, subscribers pay hundreds of dollars a year to receive their reviews—which are considered highly unbiased and objective.

In summation, their 75-page report says: "Among the top ranking programs, dBASE IV (version 1.1) is the most well rounded, with solid performance, versatility, and usability." Commenting on speed, Software Digest points out that "dBASE IV produces all three test reports as fast as or faster than FoxPro/LAN." As for Ease of Use/Ease of Learning, dBASE IV scored as many times in the Excellent range as any other database product tested.

Of course, Software Digest is definitely not alone in its conclusions.

Because consumers have already made dBASE IV version 1.1 the #1 best-selling PC database in the world.

Call 1-800-437-4329 ext. 1407 for more information.

Better yet, call 1-800-2ASHTON now to upgrade.

The truth is, no other database can do so much to improve productivity.



dBASE IV

Ashton-Tate®

P104 phosphor gives you a bright paper-like image that's virtually flicker-free.

Our Windows driver supports all three modes (Real, Standard and Enhanced).

Anti-glare screen gives you optimum performance in any lighting condition.

The built-in tilt and swivel base adjusts in any viewing angle.

Get the Full Benefit of Windows 3.0 with a Mirror Two-page Display.

Complete PixelView PC/M system includes everything you need to get the most of your PC.

Includes cables and software.

Backed by our 30-day money back guarantee.

COMPLETE PIXELVIEW PC/M SYSTEM

\$997

IN STOCK! ORDER FACTORY-DIRECT!

"We've Broken the Price Barrier to Large Screen Productivity!"

Why Pay 50% More When You Can Buy Factory-Direct!

Our engineers were given the charter to build no-compromise PC display systems. The result is the introduction of three complete systems that rival the very best, at prices that make them a better value. The savings you realize are not due to product differences so much as distribution differences. We chose to bypass the middleman, eliminating rep commissions and dealer mark-ups to save you money.

Support for Virtually Every Application.

All three of our PixelView PC displays run any application operating under Windows 3.0. And each comes with large screen drivers for the most popular applications including AutoCad, Ventura Publisher, GEM/3, WordPerfect, and Word 5.0. Our PixelView PC/III is 100 percent Hercules compatible, allowing you to switch back and forth from Hercules to high resolution to run virtually all DOS applications. And our PixelView PC/IGS gives you VGA emulation, 16 shades of gray, and hardware pan and zoom.

CIRCLE 248 ON READER SERVICE CARD

TECHNICAL SUPPORT HOTLINE: (812) 633-2105

Hours: Weekdays 8 a.m. - 6 p.m. CST

Telephone: (812) 633-4450

Fax: (812) 633-3136

2644 Patton Road, Roseville, MN 55113

Introducing! 486 Screen Performance From Your 286 or 386!

Each PixelView Interface is designed around an extremely powerful coprocessor that redraws screen images faster than any competitor's high resolution design. In fact, the PixelView PC redraws the screen in .25 seconds! That means your 286 or 386 can redraw at a speed only before attained on a 486!

Over 5 Years Experience in Graphical User Interfaces.

Mirror Technologies has been designing peripherals for graphical user interfaces since 1985, and is today the largest direct marketer of large screen displays for the Macintosh. This experience translates to not only the finest large screen displays, but also the most capable support after the sale.

Risk-Free Money Back Guarantee.

"Try one for 30 days, if you don't love it...I want it back. We ship 95 percent of our orders within 24 hours, so you'll be saving money and time."

Ronald E. Eibensteiner

Ronald E. Eibensteiner, President/CFO

Make The Right Choice!

	PixelView PC/I	PixelView PC/III	PixelView PC/IGS
Display type	1 bit mono	1 bit mono	4-bit gray scale
Display size	19.5"	19.5"	19.6"
Resolution	91 dpi	91 dpi	91 dpi
Screen phosphor	P104	P104	P104
Hercules emulation	No	Yes	Yes
VGA emulation	No	No	Yes
OS/2 1.2 Support	Yes	Yes	Yes
Hardware panning	Yes	Yes	Yes
Hardware zoom	No	Yes	Yes
Anti-glare screen	Yes	Yes	Yes
Tilt and swivel base	Yes	Yes	Yes
Full year warranty	Yes	Yes	Yes
Dealer mark-up	No	No	No
Introductory Price	\$997	\$1297	\$1797

MIRROR TECHNOLOGIES

Call Today! Order Factory-Direct.

1-800-654-5294

Mirror Technologies and PixelView are trademarks of Mirror Technologies, Inc. All other trademarks and trade names belong to their respective holders. Price availability subject to change without notice. Not responsible for typographical errors.
© 1990 Mirror Technologies, Inc.

PM01b

files). Though it's not as versatile as *Bridge Tool Kit* for customizing your *Windows* environment, it offers full conditional branching and is good for launching sets of applications and performing batch procedures such as system backup. You can even use it for timed events by turning to *Windows Workstation's* Clock function.

Recorder Run

e-Image, 9830 82nd Ave., #106,
Edmonton, Alberta, Canada, T6E 1Y8.
List Price: \$10.

CIRCLE 625 ON READER SERVICE CARD

Hotkeys

Software GT, 1659 Alma, Palo Alto, CA
94301.
List Price: \$20.

CIRCLE 626 ON READER SERVICE CARD

TEXT EDITORS

by Barry Simon

The *Windows* Notepad is so much better than EDLIN (the line editor that comes with DOS) that you're probably thrilled with it. And well you should be: It offers a full-screen text editor with text searches, an undo buffer, and printing capability. It can even put date stamps in a file.

Still, it is hardly the best text editor that can be imagined. It can't edit multiple files (unless you run multiple copies of the program), and it lacks keyboard macros other than what you can dummy up with Recorder. You can't print part of a file or pick the font used, you can't insert a file in the middle of another, and you can't search-and-replace text strings. Most of all, it has a severe limit on file size; the largest file you can edit is in the 40K to 50K range. If these limitations are cramping your style, consider these replacement text editors.



**PUBLISHING
TECHNOLOGIES INC.
Pubtech Text
Editor**

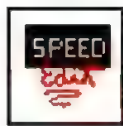
The *Pubtech Text Editor* is available as a \$79.95 standalone product or comes bundled with the *Pubtech File Organizer* (see the section on File Managers). It addresses almost all of Notepad's limitations, except for the ability to edit multiple files without opening another copy of the editor.



The *Pubtech Text Editor* will open files of virtually any size, the only limit being disk space (though we found that opening a 1.3MB text file and then pressing the End key caused the system to crash). Undo is also limited only by size. It's a wonderful feeling of freedom to know you can go back multiple levels while editing. You can print a marked block or the entire file in the font of your choice. You also can choose the screen font that the program uses. In addition, you can insert the date or the time into a file, and you can merge any text file into the current file.

The program has a search-and-replace feature and the ability to change the case of a marked block. Of particular usefulness is *Pubtech Text Editor's* ability to launch other applications from the editor; you can add them to a menu and assign them to hotkeys. You can also record macros and assign them to keys. Keys are assigned via an interesting graphical representation of the keyboard.

Some elements of the program's interface, for example the file load dialog, are nonstandard, which some users may find disconcerting. Despite this fact, most users will find this editor a pleasure to operate.



**BRADFORD BUSINESS
SYSTEMS INC.
SpeedEdit**

The *SpeedEdit* program (\$295) is a professional file editor that commands a professional price. It's relation to Notepad is akin to Notepad's relation to Edlin: *SpeedEdit* is the closest thing that *Windows*

FACT FILE

Pubtech Text Editor
Publishing Technologies Inc.,
7719 Wood Hollow Dr., #260, Austin, TX 78731; 800-782-8324, 512-346-2835.
List Price: \$79.95.
Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.
In Short: Although it cannot open multiple files, this replacement text editor addresses almost all of *Notepad's* limitations while remaining easy to use.

CIRCLE 627 ON READER SERVICE CARD

SpeedEdit

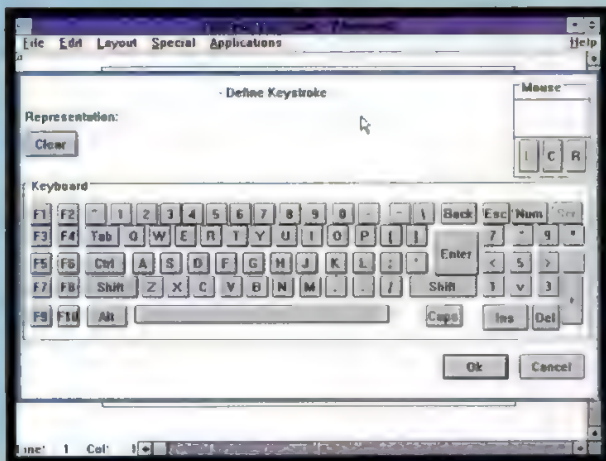
Bradford Business Systems Inc., 23151 Verdugo Dr., #114, Laguna Hills, CA 92653; 714-859-4428.
List Price: \$295.
Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, DOS 3.1 or later. Mouse recommended.
In Short: While its complexity and advanced features make it most suitable for programmers, *SpeedEdit* will appeal to others who regularly deal with large files or who need its full-fledged macro language to automate text-editing tasks.



CIRCLE 628 ON READER SERVICE CARD

currently has to Brief or Kedit.

SpeedEdit allows command input from menus, optional function keys on-screen, a pop-up list of commands, and a pop-up command-line mode. Because the command-line mode remembers previous



The *Pubtech Text Editor* lets you reassign any key, using this easy-to-use graphical display. It also lets you append text to the clipboard and print in any font that your printer supports.

it's easy to make chocolate moose.

OR (o) & -OSIS] 1 an
teen parts lose their
production due to
-deficiency anemia
g the skin to turn a

+ THI- + AZ- + IDE]
ating hypertension.
extra salt and water

trivalent chl
trm-

247

chlorosis / cholinesterase

chockle-block (-a bläk') *adj.* [see prec & BLOCK] 1 *Naut.* a) pulled so
tight as to have the blocks touching (said of a b) g tackle) b)
hoisted all the way up. ad a signal flag 2 -
tightly together
chock-full (chäk 'fool') -
cheke, cheek +
full as -

< choke.
CHOKE] as

via Fr
powder
ted and
sugar
-adj.
oc'o-

arge

cholorosis / cholinesterase
[see prec. & BLOCK] 1 *Naut.* a) pulled so
tight as to have the blocks touching (said of a hoisting tackle) b)
hoisted all the way up. as a signal flag 2 crowded or jammed -*adv.*

chocolate moose /c'hak-(e)let/mus/n, pl moose: a large
member of the elk family
dipped in chocolate.

cho-co-la-tier (chô'ka la tir') *n.*
a maker or seller of chocolate
candies, esp. fancy or expensive
ones
Choc-taw (chäk'tô') *n.* [Choctaw
chahla, a self-designation] 1 *pl.*
-taws' or -taw' a member of a
North American Indian people
who lived in S Mississippi,
Alabama, Georgia, and Louisiana
and now live in Oklahoma and
Mississippi 2 the Muskogean
language spoken by this people
choise (chois) *n.* [ME & OFr
choisir, to choose <
to taste, test; see



chocolate moose 1

able part 5 a variety
alternative

by recognizing the layout of even
the most complicated material.
Including multi-column pages
and numerical tables. AccuScan
automatically separates text from
graphics, making it easy for you
to pick and choose the infor-
mation you want. An optional
twenty-page automatic document
feeder makes you even more
efficient.

The ScanJet Plus gives you a
head start. With one-button auto-
matic text scanning. Live preview

for instant feedback on image
quality. And auto exposure, which
works like a point and shoot
camera. To make things even
easier, it features on-line help.

HP has added all these impressive
capabilities to a scanner known
for its superior image scanning.
The ScanJet Plus reads 256 levels
of gray for smooth shading and
more realistic graphics.

For a limited time,* we'll pay you to
make your office more productive.
HP is offering a rebate of \$100

when you buy an HP Automatic
Document Feeder and HP Accu-
Scan or a third-party OCR package.
For more information on this offer
and the name of your nearest
authorized HP dealer, call 1-800-
752-0900, Ext. 1666. And even if
you never make chocolate moose,
you'll have a recipe for success.

**hp HEWLETT
PACKARD**

How to make the work go faster
and the money go slower.



NEC® PowerMate 386/25S. The affordable entry to high performance 386 processing.

For advanced applications like CAD/CAM, presentation graphics or financial modeling, you can't go wrong with the PowerMate® 386™/25S.

For far less than comparable 386 systems, you get 25MHz speed, 2MB of RAM (easily expandable to 16MB via SIM modules) and a 32K memory cache. You also get something you can't get from anyone else at any price:

NEC. For more information call 1-800-NEC-INFO.



Computers and Communications

NEC

CIRCLE 157 ON READER SERVICE CARD

commands, it can be quite handy. In addition to keyboard macros, *SpeedEdit* has a full-fledged macro language with if/then/else loops, which allow automated text processing. You can apply a macro to the current file or even to all files meeting a given specification. In addition, *SpeedEdit*'s macros support the DDE Execute command. *SpeedEdit* also has versions with the same basic macro language for DOS, OS/2, Presentation Manager, Unix, and Xwindows.

You can open multiple copies of *SpeedEdit* with the copies linked via a *Windows* menu that allows easy switching between copies. There is no limitation on file size. Searches can use Unix-style expressions if you wish. There are undo, limited only by disk space, and redo (to undo the undo) functions as well.

The program makes intelligent use of the mouse interface so that, for example, the left and right mouse buttons are used to choose whole lines and stream blocks respectively. But that's only the default—like virtually every other aspect of the program, you can reconfigure the mouse buttons to do whatever you would like them to do. You can totally change the menu structure as well, if you so desire. The program also makes admirable use of colors so that you can tell at a glance what lines have been changed within the file.

SpeedEdit includes special facilities for launching compilers and having information returned to *SpeedEdit*. While its primary market is clearly programmers, *SpeedEdit* should be of interest to other *Windows* users who have a need to deal with large files or to automate text manipulation.

ADDITIONAL TEXT EDITORS

Two text editors were unavailable for review, but are worth a look. Since they're both shareware, the look, at least, is free. *WinEdit* (\$59.95 from Wilson WindowWare) is a robust editor that sports a multiple document interface and a macro language, while *PowerPad* (\$19 from Deming Software) is a more basic model with search-and-replace and line-count functions. And if you're a programmer, check out *CView* (a \$99 commercial product from Eastern Language Systems). As the name implies, it is aimed specifically at C programmers and has automatic indenting and other features useful to C programmers.

For browsing text files, a dedicated text-file viewer loads faster than a full-fledged text editor. *DeskTop Set* (see the Accessories section) has a very nice file viewer hidden among its accessories, and it has full support for *Windows* fonts (screen and printer). The program features a range of page layout options, including headers and footers. You can search for text strings and set multiple bookmarks to preserve your place. If this sounds too complicated, a simpler text viewer is *PC Magazine*'s free utility *Win-smooth*, which smoothly scrolls text files in a window.

CView

Eastern Language Systems, 39 West 300 North, Provo, UT 84601; 801-377-4558.

List Price: \$99.

CIRCLE 629 ON READER SERVICE CARD

ICON EDITORS

by Laura Cox

Icons may seem like just another way to jazz up your screen, but all that flair and color is really a means to an end: finding and starting your applications in the Program Manager or on the *Windows* desktop. You can assign icons to represent data files as well as programs, so the icons become a miniature representation of all your documents.

Every made-for-*Windows* program contains predefined icons within its executable file, but you must supply icons for DOS applications. Though you can choose from six generic icons located within *PROGMAN.EXE* or even borrow an icon from another *Windows* program, this isn't nearly enough variety to distinguish most people's files. Even if you use the generic icons, you may want to color-code them or modify them to represent different types of files.

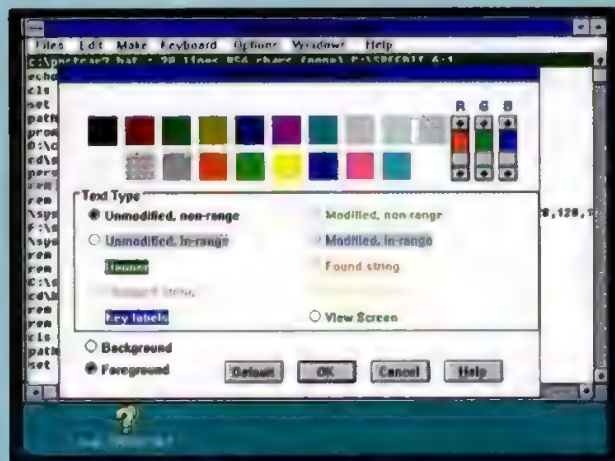
Public bulletin boards (such as the MSWIN forum on CompuServe) are literally jammed with icons that you can download and apply to your applications. Many come as single .ICO or .ICN files, while others let you choose from a library of precustomized icons. To guarantee the perfect icon for that hard-to-define application, you need an icon editor, which lets you modify existing icons or create entirely new ones.



PHILIP B. ESKELIN, JR.
IconDraw

IconDraw is easy to use, but is limited in features. This shareware program (with a registration fee of \$10) includes six drawing tools, accessed by clicking on oversize selection buttons or by choosing the tool from a menu. In addition, there is a palette of 16 colors supported by standard *Windows* drivers. Its documentation is a measure of its simplicity; the *README.TXT* file is all you need to use it.

Although *IconDraw* doesn't supply all the tools you'd find in a paint package, it does include the basics: a pencil tool for freehand drawing, a box tool, a filled rectangle tool for creating colorful boxes, a line tool, and filled and open ellipse tools. A small viewing window shows the actual size of your icon as you draw it;



SpeedEdit offers powerful customization options, including a robust command language that you can also access directly through a pop-up window, as shown here.

since you create the icon directly, you won't be disappointed by scaling it down to fit. With a little imagination, you don't have to be an artist to create an acceptable icon.

Though it comes with a small library of nine icons, *IconDraw* is best for creating icons from scratch. True, it can import any .ICO file directly, but it can't extract icons from executable files and it lacks the editing capabilities to modify existing icons easily. Its only editing tool is a command to clear the screen. There's not even an eraser tool, though with a little care you can use a background the same color as the icon to cover up your mistakes. An enhanced version will include an editing grid and an undo feature, however.

Within its limitations, *IconDraw* is a decent product. If you don't want to spend the time with a complete paint package, it's a good choice for creating icons quickly. But if you work frequently with icons, you'll soon have a run-in with its limitations.



IMPACT SOFTWARE PBIcon

PBIcon from Impact Software is a useful shareware utility (a steal at the \$10 registration fee) that works with the aid of any Windows-based paint program, such as *Windows Paintbrush*, to generate icons out of paint files.

Since it relies on external paint programs, *PBIcon* may be more confusing than its competitors if you're a beginner. But it's easy to use if you're familiar with the basics of paint packages, and you'll appreciate the better editing environment that this approach offers. Text fonts, for instance, would be hard to duplicate with the bare-bones tools that *IconEdit* offers, but they're a piece of cake in *Paintbrush*.

Once you've finished creating your icon, you can simply copy it to the clipboard and paste it into *PBIcon*. Since an icon must be exactly 32 by 32 pixels in size, *PBIcon* offers an icon-size viewport, and you can move the pasted image beneath the viewport (using small scroll bars) until you can see exactly the portion you want. This design comes in handy when a newly created icon is slightly off center or a bit too large for the pixel box.

You can also paste from *PBIcon* to your paint program, which is useful as a guideline when shrinking a large picture down to icon size. This feature is helpful



because it's easier to paint a large version of an icon and then shrink it down than to paint a smaller version directly, though the resulting icon will lose color and clarity in the shrinking process.

PBIcon's Capture function, which in theory allows you to capture a 32-by-32-pixel image from anywhere on-screen, is potentially an excellent way to capture and edit existing icons. But in practice it's very difficult to get useful results; there's no visual feedback, in the form of a pointer or otherwise, that shows you where you are on-screen. It's almost impossible to capture the section you want.

An updated version (to be renamed *Icon Manager*), expected to be on the market by the time you read this, will support 256-color video drivers and will allow you to extract icons directly from executable files for modification. It will also make icon management easier through the addition of a clip-art library file, which will store icons on disk in a compressed format. But even without these improvements, *PBIcon* works well and is a satisfactory product.

ADDITIONAL ICON EDITORS

Another icon editor worth a look is hDC's *Icon Designer*, which was released too



FACT FILE

IconDraw

Philip B. Eskelin, Jr., 10814 Orchid Pl. NW, Silverdale, WA 98383; CompuServe ID: [76701,152]

List Price: \$10.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, Microsoft Windows 3.0, DOS 3.1 or later. Mouse recommended.

In Short: A simple program with a few functions, this icon editor is good for absolute novices, but it lacks the tools needed to create icon designs above the most basic level.

CIRCLE 630 ON READER SERVICE CARD

PBIcon

Impact Software, 12140 Central Ave., #133, Chino, CA 91710; 714-590-8522.

List Price: \$10.

Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, Microsoft Windows 3.0, DOS 3.1 or later. Mouse recommended.

In Short: This icon editor relies on *Paintbrush* or other external paint programs for its drawing talents by importing images through the clipboard.

CIRCLE 631 ON READER SERVICE CARD

late to be included in this review. Working in conjunction with *FirstApps*'s *MicroApp Manager*, this \$59.95 program is snappy, with exploding windows and 3-D buttons. But its drawing tools are basic; you must create icons by coloring in pixels one by one. It can, however, extract an icon from an executable file and modify it for use in other applications, and it comes with an icon manager and a library of over 100 professionally designed icons. Note that hDC's *Windows Express* includes a built-in icon editor.

Transparent Icon Editor, a \$10 shareware program, is a curiosity that you may find on some bulletin boards. Though it creates Windows icons, *Icon Editor* is a DOS program, so you don't need Windows to run it. It has no drawing tools at all; you create images by filling in pixels one by one on a 32-by-32-pixel grid, and it comes with a small library of customized icons.

Transparent Icon Editor

Jason Lacombe, 32 The Hills Rd., R.F.D. #2, Auburn, NH 03032.

List Price: \$10.

CIRCLE 632 ON READER SERVICE CARD

NETWORK UTILITIES

by Rock Miller

One of *Microsoft Windows 3.0*'s most important improvements is in its support for networks. There's now an easy procedure for installing Windows on a file server, and Windows 3.0's use of paths and environment variables prevents temporary and system files from stepping on each other, an all-too-common problem in *Windows 2.x* installations. Drivers for several LANs let you perform common network functions from within the Windows environment.

Still, the implementations of these facilities aren't always the best thought-out. You can control network print jobs through *Print Manager*, for example, but only at arms length; you can't manipulate the network print queues directly. And though you can log onto the network through the Windows Control Panel (not the first place you'd look for such a function), mapping drives to network volumes is a function of the File Manager. This can lead to some fancy mousework when attaching to new servers. Other critical issues, from security to interface consis-

NEW! Version 4 of R&R for dBASE!

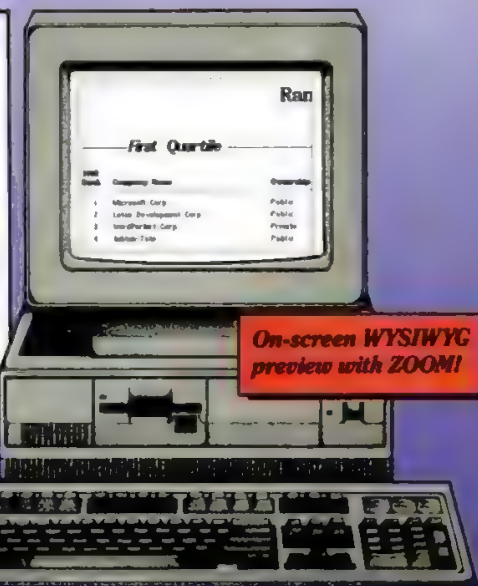
SoftMeter
TRENDS & STRATEGIES IN SOFTWARE PUBLISHING

Jim P. Marx, Chairman
Lotus Development Corp.
10 Cambridge Way
Cambridge, MA 02142

Dear Mr. Marx:

As president of Lotus Development Corp., you know that your company ranks among the top software publishers and developers in the world. The ranking was developed by the publisher of a series of reports published in Cambridge, MA. Lotus Development Corp. is a very successful company and we congratulate you on your success.

The 1990 Soft-letter 100 Ranked by 1989 Revenues within Quantiles																					
First Quantile																					
Rank	Company Name	1989 Revenue	1988 Revenue	1987 Revenue	1986 Revenue	1985 Revenue	1984 Revenue	1983 Revenue	1982 Revenue	1981 Revenue	1980 Revenue	1979 Revenue	1978 Revenue	1977 Revenue	1976 Revenue	1975 Revenue	1974 Revenue	1973 Revenue	1972 Revenue	1971 Revenue	1970 Revenue
1	Microsoft Corp.	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	\$176,475,000	
2	Lotus Development Corp.	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000	
3	Novell Inc.	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	\$80,000,000	
4	Oracle Corp.	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	\$60,000,000	
5	IBM Corp.	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	\$50,000,000	
6	Software Publishing Corp.	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	\$40,000,000	
7	Apple Inc.	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	\$30,000,000	
8	Microsoft Corp.	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	\$20,000,000	
9	Software Publishing Corp.	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000	
10	Microsoft Corp.	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	
11	Software Publishing Corp.	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	
12	Microsoft Corp.	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	
13	Software Publishing Corp.	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	
14	Microsoft Corp.	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	
15	Software Publishing Corp.	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	
16	Microsoft Corp.	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	
17	Software Publishing Corp.	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	
18	Microsoft Corp.	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	
19	Software Publishing Corp.	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	
20	Microsoft Corp.	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	
21	Software Publishing Corp.	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	
22	Microsoft Corp.	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	
23	Software Publishing Corp.	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	
24	Microsoft Corp.	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	
25	Software Publishing Corp.	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	
26	Microsoft Corp.	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	
27	Software Publishing Corp.	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	
28	Microsoft Corp.	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	
29	Software Publishing Corp.	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	
30	Microsoft Corp.	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	
31	Software Publishing Corp.	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	
32	Microsoft Corp.	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	
33	Software Publishing Corp.	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	
34	Microsoft Corp.	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	
35	Software Publishing Corp.	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	
36	Microsoft Corp.	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	
37	Software Publishing Corp.	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	
38	Microsoft Corp.	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	
39	Software Publishing Corp.	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	
40	Microsoft Corp.	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	
41	Software Publishing Corp.	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	
42	Microsoft Corp.	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	
43	Software Publishing Corp.	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	
44	Microsoft Corp.	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	
45	Software Publishing Corp.	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	
46	Microsoft Corp.	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	
47	Software Publishing Corp.	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	
48	Microsoft Corp.	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000</									



Printed with HP LaserJet.®

R&R gives you ready-to-publish reports from dBASE® files, without programming.

Making good-looking reports has always been easy—even fun—with R&R's screen painter, Lotus® style menus, and standard-setting features!

For people who program and those who don't.

From columnar listings and mailing labels to pre-printed forms and form letters, R&R helps you create the professional-looking reports you want. Without writing a single line of code.

Developers get the power and flexibility to avoid report programming. Plus a royalty-free runtime to print reports from within applications.

People who don't program get the ease-of-use to do ad hoc custom reports on their own.

Great-looking reports. More power than ever. With these and other NEW Version 4 features.

- Exploit HP and PostScript® laser printing power. Print any fonts you have, anywhere you want them.
- ZOOM in on the fine print. Refine layout details with the help of on-screen WYSIWYG preview.
- Pre-process totals to print them in headings, compute %-of-totals, sort and query with totals, and more.
- Use dBASE III®, III Plus®, IV®, Clipper®, Quicksilver®, dBase®, FoxBASE +®, FoxPro™ Index support is built-in.

"The undisputed reporting champ of the dBASE world..."

PC World, July 1990

"The first time I used it, R&R paid for itself 10 times over." "I don't know what I'd do without R&R." "Best product I've ever purchased in my life!"

Unsolicited Comments of R&R Users

Join more than 90,000 others who already enjoy the time-saving features of R&R.

Order now! Only \$249. Call about upgrades.

30-day moneyback guarantee when purchased directly from Concentric.

Call 800-325-9035 to order, or for more information and dealer names.

CIRCLE 315 ON READER SERVICE CARD

R&R Report Writer™

The award-winning family of R&R Report Writers includes versions for dBASE, ORACLE® SQL, Novell NetWare SQL, XDB-SQL®, Lotus 1-2-3® and Symphony®.



Concentric Data Systems, Inc., 110 Turnpike Road, Westboro, MA 01581 508-366-1122, Fax 508-366-2954



THE PLUS IS DOS/MAC COMPATIBILITY.

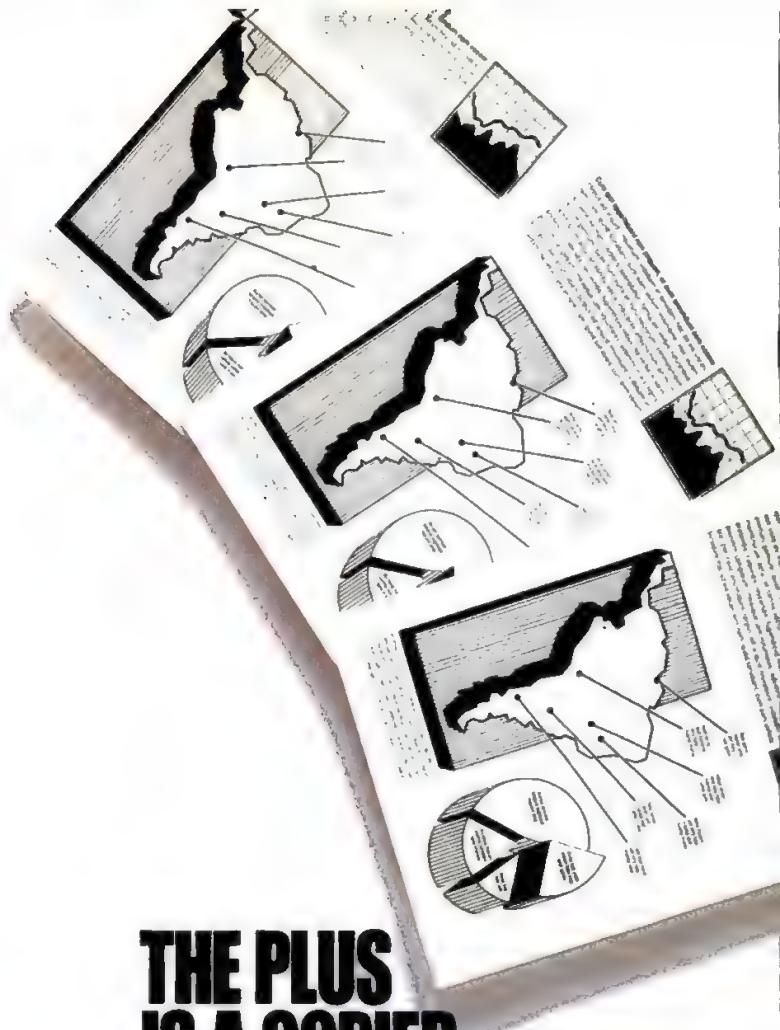
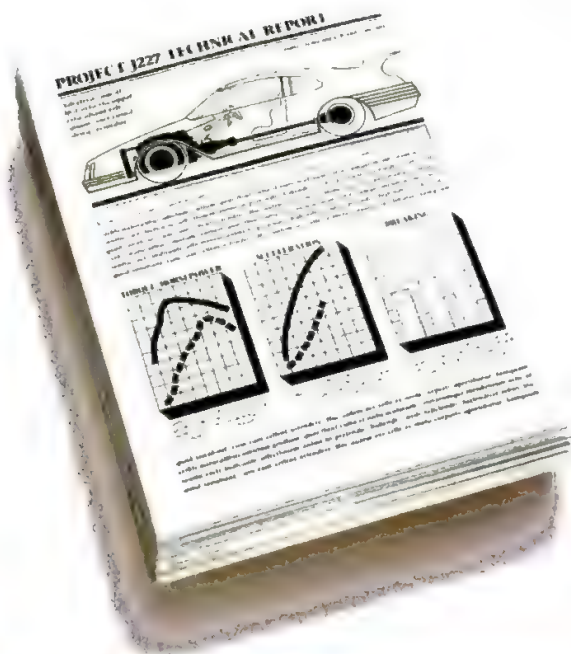
*Introducing the Kodak Ektaplus 7016 printer.
Equipped with Adobe PostScript
language/Appletalk interface options,
it can support both DOS and
Macintosh computers simultaneously!
Configure it with four ports,
and it can support up to four
users, or even four
networks. Six emulations
make it an ideal
shared printer for any
work group.*



THE PRINTER WITH A PLUS. KODAK

THE PLUS IS 16PPM SPEED.

Twice as fast as traditional printers, the Kodak Ektaplug 7016 printer can make you at least twice as productive. It maintains fast, high-quality throughput, even when printing Adobe PostScript language. It helps you get more done in a day.



THE PLUS IS A COPIER.

Imagine the convenience of having a built-in copier for those frequent one- or two-copy jobs! The Kodak Ektaplug 7016 printer comes standard with a 6 pages-per-minute convenience copier that keeps everybody on the job instead of on the run.



The Kodak Ektaplug 7016 printer comes with the quality and reliability you've come to expect from the world leader in imaging. For the name of the dealer nearest you, call 1 800 344-0006, Ext. 456.

Kodak Ektaplug 7016 printer





Proof positive...
Nikon's scanner
performs
picture perfect,
professional
pre-press processing.

Whether you're already doing pre-press processing on your desktop publishing system, or are thinking of getting into it, or just want precise color control of the pictures you send to your outside separator, the Nikon LS-3500 Film Scanner is hot stuff.

This high quality scanner is packed with prime performance features—working with 35mm positives or negatives, it provides an unprecedented 25 million, 24-bit pixels of resolution. That means it can accurately reproduce every subtlety of color with crisp, breathtaking detail. Its proprietary color separating software is perfect for a Mac® II, any MS-DOS® or UNIX®-based system. The on-board intelligence makes it easy for anyone to use. And it's compact and economical—no competing system performs anywhere near as well for anywhere near the price.

Oh, yes—where's the proof positive? This complete page is peppered with it. (Scanned and separated by the Nikon LS-3500 from a photo shot by Michael Pruzan with a Nikon camera.) Impressed? Phone or write for complete details: Nikon Electronic Imaging, Dept. EB-1, 101 Cleveland Ave., Bayshore, NY 11706, (516) 222-0200 Ext. 324. Or call 1-800-NIKON-US for the dealer nearest you.



Nikon.
ELECTRONIC IMAGING

CIRCLE 329 ON READER SERVICE CARD

©1990 Nikon Inc.

Mac® II is a registered trademark of Apple Computer, Inc. MS-DOS® is a registered trademark of Microsoft Corporation. UNIX® is a registered trademark of AT&T. Kodachrome is a registered trademark of Eastman Kodak Company.

tency, aren't even addressed by *Windows*.

Fortunately, you needn't limit yourself to *Windows*' own facilities. Third-party network utilities go far to improve and supplement them.



AUTOMATED DESIGN SYSTEMS INC. **Windows Workstation**

In the old days of *Windows 2.x*, *Windows Workstation* was practically indispensable to networked *Windows* installations; it offered the only way to perform most network functions within the *Windows* environment. Even though *Windows 3.0* has taken over some of these capabilities, you'll still find ample reason to shell out the fee (\$695 per ten users) for the *Windows 3.0* version of the program.

In appearance, *Windows Workstation* presents itself as a collection of utilities rather than as a single unified program. The main *Workstation Menu* program offers centrally maintainable network menus, plus a convenient control station for other functions. Several small programs (loaded as icons on startup) provide intercom (or "rude messaging") services, an alarm clock, a timed execution facility, a security lock, and screen blanker. And a separate *Workstation Print Manager* substitutes for your network print spooler utility, letting you select network printers and manage the print queues. Menu and script editors complete the mix.

A POTPOURRI

Windows Workstation's most immediate attraction arises from the things it does



that *Windows* doesn't. The Secure Station option, for instance, locks up your keyboard and mouse, and blanks your display after a given time or on demand. Cleverly, the system lets you unlock your station using your network password, so you don't have to remember a second one (though you can assign a different password if you like). If more than five unsuccessful attempts are made to break into a secured workstation, that fact will be recorded in the supervisor's log file. The Security menu also offers file encryption, but since you must do this manually, it's not very useful.

The Intercom option is just what is needed to make your network's rude messaging functions a really useful means of communication. You send messages using a pop-up dialog box, which lets you scan through the list of users and groups on the network and to select multiple recipients with the mouse (much easier than trying to remember them yourself). Received messages can pop up over whatever you're working on, and unlike DOS where your messages are lost forever as soon as you resume work, you can set aside received messages for later reading. The Intercom menu also has an excellent utility for attaching and detaching servers, which shows you what servers you're already attached to, as well as giving you list boxes to search through existing servers; this should really be more prominent.

An improved system clock utility, which takes its time from the server to which you initially log on, gives you alarms and event timers as well as the time of day,

FACT FILE

EDITOR'S CHOICE

Windows Workstation
Automated Design Systems Inc., 375 North Ridge Rd., #270, Atlanta, GA 30350; 800-366-2552, 404-394-2552.
List Price: \$695 (10 users).
Requires: 1MB RAM, hard disk, EGA or VGA graphics adapter, *Microsoft Windows 3.0*, Novell *NetWare 2.1* or later, *Microsoft LAN Manager 2.0* or IBM *LAN Server 1.2*, DOS 3.1 or later. Mouse recommended.
In Short: This collection of utilities makes your network much more accessible. If you share printers over the network, the print manager alone is worth the cost.

and even offers a "snooze" button to turn off the alarm without losing it.

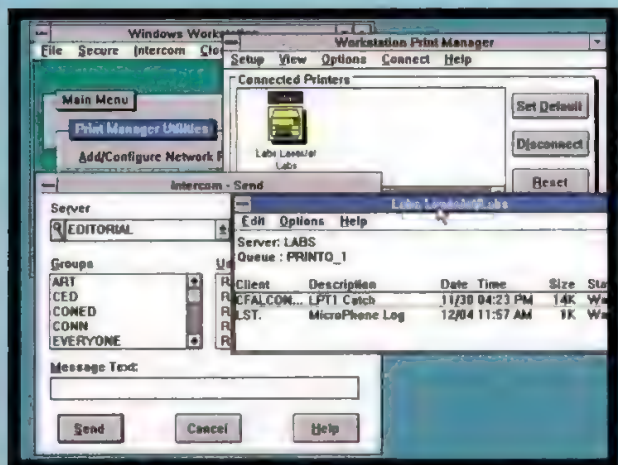
INDISPENSABLE FOR PRINTING

However, the most important benefits come from improving on rather than extending *Windows* functions. The new *Workstation Print Manager*, especially, is a godsend if you must share printers on multiple servers. Simple, well-designed dialog boxes make it surprisingly easy to navigate through the various servers and set up their printers for use, and you can easily attach to up to three network and/or local printers by clicking on a simple icon display. Printer selection works through the *Windows* Control Panel, so you can change the printer centrally for most applications (some, such as *Windows Write*, don't support this, but in this case you can select the printer using the Printer Setup option from within the application).

Clicking on a printer brings up an independent window that shows the print queue. Here you can easily delete or hold your own jobs, and if you have the appropriate network rights as a Queue Operator, you can hold, release, cancel, or reprioritize any jobs in the queue. The queue window is updated automatically at time intervals of your choosing (typically 8 or 10 seconds), and you move, resize, or iconize the queue window for future reference as long as Print Manager is open.

CONTROLLABLE MENUS

The *Windows 3.0* Program Manager interface is one of its best features, but from a LAN administrator's point of view, what it gives up in consistency and controlla-



The new *Windows Workstation Print Manager* is indispensable if your system requires sharing printers on multiple servers.

COREL DRAW!

The Overwhelming Choice Of PC Users!

1990 Readers' Choice Awards
(December, 1990)



From a cast of thousands of products, the 1990 Readers' Choice Awards acknowledged CorelDRAW as the most popular PC program in any category. And, for the second year in a row, CorelDRAW won first place as the favorite product in the Draw category with a landslide victory — adding yet another award to this highly acclaimed program.



Call Corel now
1-800-354-2545
or visit our website at www.corel.com
Corel is a registered trademark of Corel Corporation.

*CorelDRAW! — The World's Finest PC
Graphics Software For EVERYONE!*



© 1991 Corel Corporation. All rights reserved.

bility is what it gains in attractiveness. *Windows Workstation* offers a more traditional menu-based interface, which can be installed as your primary shell or run in tandem with Program or File Manager. The menus look disappointingly basic (only one multilevel menu appears in a window, though menu levels are nicely stacked so that it's easy to go directly to any level by clicking on your mouse). But they are true network menus that the LAN administrator can update globally while users are on-line (the system recovers gracefully and picks up changes automatically when it detects they've been made). You can define group menus and personal menus, and you can assign passwords, accelerator keys, and on-line help to every menu item. A slick menu editor lets you create menus by cutting and pasting, and you can test the effect of any entry as you edit it.

Menus can run programs directly, but they can also execute complex batch jobs defined in the *Windows Workstation's* Multiset script language. Multiset scripts make it possible to create "application sets" for loading several related applications at once to automate procedures such as backup, and (in conjunction with the Clock utility) to execute timed events. The language itself offers an array of batch commands (including commands for performing network and system functions such as attaching to servers, retrieving user names and physical station numbers, setting environment variables, and modifying SYSTEM.INI and WIN.INI settings), and it supports conditional branching and custom dialog and file list boxes for user input. A simple multiwindow text editor, similar to *Windows' SYSEDIT*, is supplied for writing and editing scripts.

INSTALLATION HEADACHES

With all these strengths come a few weaknesses, the most severe of which lies in the installation procedure. Though installation is fairly simple, its failings stand in sharp contrast to the solid quality of the rest of the program. The installation manual fails to distinguish between the two different program directories or to explain why one of them must be on the network while the other may be on a local or network directory. The installation program crashed at different points on two different brands of PCs. Once you have got the files copied, the installation manual does not even mention the critical step



of copying and installing drivers so that they can be used by the *Workstation Print Manager*.

Although you may not need to use all of *Windows Workstation's* features, it's

The new *Windows Workstation Print Manager* is indispensable if your system requires sharing printers on multiple servers.

still a good buy if you have enough stations to spread the cost. It offers a little something for every network user, and its modular design lets you choose what you need. Indeed, if you use network printers at all, the *WorkStation Print Manager* alone is worth the cost.

A SUPERVISOR UTILITY

Network administrators also need *Windows* based versions of their network utilities. Though it was not shipping at the time of our review, *NetMagic* from R.D. Software fills this gap.

NetMagic substitutes the Novell NetWare utilities SYSCON, PCONSOLE, and FCONSOLE. It lets you set up user accounts and user groups. You can define access rights and security privileges. You can manage network print queues, holding, reordering and deleting jobs. And you can broadcast global messages. You can also view graphs of disk and network capacity utilization and track network performance a number of different ways. *NetMagic* costs \$695 per file server. ■

NetMagic

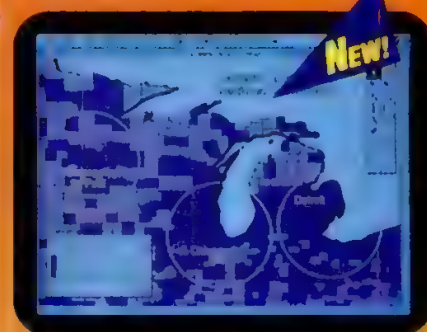
R.D. Software Inc., 2393 Maple Ave., Peekskill, NY 10566; 914-739-4579.
List Price: \$695 (per server).

CIRCLE 634 ON READER SERVICE CARD

SEE YOUR DATA!



New MapInfo for Windows™ and MapInfo for Macintosh™ can find, display, and analyze your data geographically. Overlay data directly from spreadsheets, databases and ASCII files onto maps—from worldwide to street level. We can even supply maps and data for the entire U.S. Street maps, ZIP codes, counties, demographics, and more.



Work with your data in three ways: on maps, graphs, and in traditional rows and columns. Use the built-in SQL querying tools to perform powerful analyses. And now, you can share data across platforms. MapInfo looks and acts the same on Windows and Macintosh.

Now, there are more ways than ever to see your data with MapInfo. Whatever your platform—DOS, Windows™ or Macintosh®—MapInfo can help you see patterns, trends, and opportunities you may have otherwise missed.

MapInfo® Corp.

Changing The Way The World Looks At Information®

200 Broadway Troy, NY 12180
Call 1-518-274-8673 or 1-800-FAST-MAP
for a reseller near you.

MapInfo and Changing The Way The World Looks At Information are registered trademarks of MapInfo Corp. Others are trademarks of their respective owners.

CIRCLE 291 ON READER SERVICE CARD

WHEN YOU CALL TANDON YOU GET A PERSON. OF COURSE, YOU CAN ALSO GET A COMPUTER.

At Tandon, we believe in selling ourselves, not just our computers.

That's why our direct sales force is made up of friendly people who are good at listening and great at helping. A highly knowledgeable group who truly enjoy answering questions about our computers.

Whether it's about our 486 EISA Desktop, a machine PC Computing described as "slick, amazingly fast, innovative and reasonably priced by 486 standards," or our equally impressive line of 386's and other 486's.

They'll also tell you everything you want to know about our high performance Slimlines, Desktops, Laptops and Network Stations, as well as our Towers.

All of which are made with the outstanding quality you'd expect from a \$400 million U.S. company with fifteen years of manufacturing and design experience, sixteen patents, and extensive research, development and engineering facilities.

But of course, we're concerned with more than just making a sale. That's why if for any reason you're not completely satisfied with your Tandon Computer, you can return it for a full refund within 30 days. And that's why every Tandon Computer comes with a one year limited warranty. On site service. And technical support. We even offer a special leasing program for your convenience.

So, pick up the phone and call one of our helpful sales representatives today. Next to our machines, they're as user friendly as you can get.

Tandon

TO ORDER DIRECT, CALL NOW:

800-800-8850

FAX 805-529-8408



\$2,499

STANDARD CONFIGURATION
Microprocessor and Main Board: Intel® 80386sx running at either 6 or 16 MHz. Main board has socket for an optional math coprocessor.
Memory: 1MB memory standard, expandable to 5MB.
Storage: 1.44MB, 3.5 inch, high density, double sided diskette drive. 40MB IDE hard drive.
Keyboard: 82 key layout emulates 101-key keyboard with embedded keypad and 12 function keys; system supports external keyboard and external 10-key keypad.
Video: Built-in VGA monitor adapter. Dual panel EL backlit monochrome VGA liquid crystal display. I/O port to support external VGA monitor.
Leasing: As low as \$142/month.
 Call for information on our LT/286 Laptop.



\$3,999

STANDARD CONFIGURATION
Microprocessor and Main Board: Intel 80386 running at either 8 or 33 MHz. Main board has socket for Intel 80387 or Weitek™ 3167 math coprocessor.
Memory: 4MB of standard memory, expandable to 16MB of 32-bit memory.
Storage: 1.2 MB, 5.25 inch, high density, double sided diskette drive, OR 1.44MB, 3.5 inch, high density, double sided diskette drive. 110MB IDE hard drive.
Keyboard: 101-key enhanced layout.
Video: 16-bit VGA adaptor with 256KB RAM, expandable to 512KB. 14 inch VGA monochrome display.
Leasing: As low as \$140/month.
 Call for information on our 386/25 Desktop.



Tandon 386sx/N Network Station

\$1,199

STANDARD CONFIGURATION

Microprocessor and Main Board: Intel 80386sx running at 8 or 16 MHz. Main board has socket for 80387sx math coprocessor.
Memory: 1MB memory standard; expandable onboard to 8MB, 16MB system maximum.
Keyboard: 101-key enhanced layout.
Video: Built-in VGA adapter. 14 inch VGA monochrome display.
Options: 1.44MB, 3.5 inch, high density diskette drive. 40MB IDE hard drive. Additional options available, please call for details.
 Call for information on our 286/N Low Profile, Network Station, starting at \$949.
Leasing: As low as \$68/month.



Tandon SL 386sx/20 Slimline

\$1,999

STANDARD CONFIGURATION

Microprocessor and Main Board: Intel 80386sx running at either 8 or 20 MHz. Main board has socket for 80387sx math coprocessor.
Memory: 1MB memory standard; expandable onboard to 5MB. 16MB system maximum. (With expansion board.)
Storage: 1.2MB, 5.25 inch, high density, double sided diskette drive, OR 1.44MB, 3.5 inch, high density, double sided diskette drive. 40MB IDE hard drive.
Keyboard: 101-key enhanced layout.
Video: 16-bit VGA adapter with 256KB RAM, expandable to 512KB. 14 inch VGA monochrome display.
Leasing: As low as \$113/month.



Tandon SL 486/25 Slimline

\$3,999

STANDARD CONFIGURATION

Microprocessor and Main Board: Intel 80486 running at either 8 or 25 MHz.
Memory: 2MB memory standard; expandable onboard to 5MB. 16MB system maximum. (With expansion board.)
Storage: 1.2MB, 5.25 inch, high density, double sided diskette drive, OR 1.44MB, 3.5 inch, high density, double sided diskette drive. 110MB IDE hard drive.
Keyboard: 101-key enhanced layout.
Video: 16-bit VGA adapter with 256KB RAM, expandable to 512KB. 14 inch VGA monochrome display.
Leasing: As low as \$140/month.

- 30-Day Moneyback Guarantee
- Toll-Free Technical Support
- 1-Year Limited Warranty
- On-Site Service
- Leasing Program Available



Tandon 486/33 EISA Desktop

\$7,299

STANDARD CONFIGURATION

Microprocessor and Main Board: Intel 80486 running at either 8 or 33 MHz. Main board accepts a Weitek 4167 coprocessor to coexist with the 80486's built-in math coprocessor.
Memory: 4MB memory expandable to 64MB of 64-bit memory.
Storage: 1.2MB, 5.25 inch, high density, double sided diskette drive, OR 1.44MB, 3.5 inch, high density, double sided diskette drive. 200MB IDE hard drive.
Keyboard: 101-key enhanced layout.
Video: 16-bit VGA adapter with 256KB RAM, expandable to 512KB. 14 inch VGA monochrome display.
Leasing: As low as \$182/month.



Tandon Tower 386/33

\$4,999

STANDARD CONFIGURATION

Microprocessor and Main Board: Intel 80386 running at either 8 or 33 MHz. Main board has socket for Intel 80387 or Weitek 3167 math coprocessor.
Memory: 4MB standard memory, expandable to 16MB of 32-bit memory.
Storage: 1.2MB, 5.25 inch, high density, double sided diskette drive. AND 1.44MB, 3.5 inch, high density, double sided diskette drive. 200MB IDE hard drive.
Keyboard: 101-key enhanced layout.
Video: 16-bit VGA adapter with 256KB RAM, expandable to 512KB. 14 inch VGA monochrome display.
Leasing: As low as \$143/month.



Tandon Tower 486/33 EISA

\$7,699

STANDARD CONFIGURATION

Microprocessor and Main Board: Intel 80486 running at either 8 or 33 MHz. Main board accepts a Weitek 4167 coprocessor to coexist with the 80486's built-in math coprocessor.
Memory: 4MB memory standard; expandable to 64MB of 64-bit memory.
Storage: 1.2MB, 5.25 inch, high density, double sided diskette drive. AND 1.44MB, 3.5 inch, high density, double sided diskette drive. 200 MB IDE hard drive.
Keyboard: 101-key enhanced layout.
Video: 16-bit VGA adapter with 256KB RAM, expandable to 512KB. 14 inch VGA monochrome display.
Leasing: As low as \$189/month.

OPTIONS AND CUSTOM CONFIGURATIONS

- Hard Drives, Diskette and Optical Drives
- Memory Expansion
- Modems
- Coprocessors
- VGA and Super VGA Monitors.
- Additional Options Available On All Systems. Please call.

Tandon reserves the right to amend specifications without notice. Tandon 486, Tandon 386, SL386sx, SL 486, LT/286, LT/386sx, 386sx/N, 286/N, Tandon Tower 386, Tandon Tower 486, PowerPoster, MultiCACHE and MIAT are trademarks of Tandon Corporation. Intel is a registered trademark of Intel Corporation. All other products or services are identified by the trademarks or service marks of their respective companies. Leasing terms vary by unit. © 1990 Tandon Corporation, Moorpark, CA.

CIRCLE 312 ON READER SERVICE CARD



TANDON PROUDLY ANNOUN

We took our SL 386sx Slimline personal computer, upped its processing speed to 20 MHz. And managed to keep its price down. Under \$2,000. The result is the Tandon SL 386sx/20. A machine that offers a few ups and downs of its own.

For starters, processing speed is up, so processing time is down. Because we've combined INTEL® 80386SX power with full 32 bit internal processing, at a speed of 20 MHz.

And size is down. Because we've packed all this into a machine that stands only 5" tall.

But system integration is up. Because the Tandon SL 386sx/20 incorporates our proprietary MIAT™ (Mapper-Integrated AT) chip, for reduced chip count and increased reliability. Built-in communication ports

and mass storage controllers on the main board provide an even higher level of integration.

And expandability is up. With two serial ports and one parallel port. And 1MB of memory is standard; expandable to 5MB on board, with a 16MB maximum using an expansion card.

Of course, with any Tandon computer we provide you with a one year limited warranty. Helpful technical support. On site service, if you ever need it. A 30 day no questions asked, full refund policy. Even a special leasing program.

So call Tandon today to find out more about the Tandon SL 386sx/20. Or for even more power, ask about our SL 486/25 for just \$3999. They both have their ups and downs in all the right places.

- 30-Day Money Back Guarantee
- Toll-Free Technical Support
- 1-Year Limited Warranty
- On-Site Service
- Leasing Program Available

Now
\$1,999

CES SOME UPS AND DOWNS.

Tandon SL 386sx/20 • Price includes system unit, 1MB RAM, 40MB IDE hard drive, 1.2 or 1.44MB diskette drive, VGA monochrome monitor, 16-bit video card, keyboard, power cord, operating and installation manual. • **Options:** 1MB and 2MB memory upgrade kits; Microsoft® Windows™ 3.0 and serial/bus mouse; additional 1.2MB and 1.44MB diskette drives; 110MB, 200MB IDE hard disk drive; VGA and Super VGA color monitors, 80387SX math coprocessor, 2400 baud modems, network cards, laser printers, Tandon MS-DOS software and manuals. **Tandon SL 486/25** • Price includes: system unit, 2MB RAM, 110MB IDE hard drive, 1.2 or 1.44MB diskette drive, VGA monochrome monitor, 16-bit video card, keyboard, power cord, Tandon MS-DOS software and manual, operating and installation manual, Microsoft® Windows™ 3.0 and serial mouse. • **Options:** 1MB and 2MB memory upgrade kits; additional 1.2MB and 1.44MB diskette drives; 200MB IDE hard disk drive; VGA and Super VGA color monitors, 2400 baud modems, network cards, laser printers. Additional options and features are available. **Call for details.**

OPTIONS AND CUSTOM CONFIGURATIONS

- Hard Drives, Diskette and Optical Drives
- VGA and Super VGA Monitors
- Modems
- Additional Options Available On All Systems. Please Call.
- Memory Expansion
- Coprocessors

Tandon

TO ORDER DIRECT, CALL NOW:

800-800-8850

FAX 805-529-8408

CIRCLE 744 ON READER SERVICE CARD

Tandon reserves the right to amend specifications without notice. Tandon 486, Tandon 386, SL386sx, SL 486, LT/286, LT/386sx, 386sx/N, 286/N, Tandon Tower 386, Tandon Tower 486, PowerPoster, MultiCACHE and IMAT are trademarks of Tandon Corporation. Intel is a registered trademark of Intel Corporation. All other products or services are identified by the trademarks or service marks of their respective companies. ©1990 Tandon Corporation, Moorpark, CA.



THE FIRST 486 WIT

You no longer need the budget for a 486™ computer in order to own one, thanks to the Tandon SL 486/25 Slimline.

That's because the SL 486/25 costs just \$2,999, thousands of dollars less than most other 486's. But more than that, Tandon's the first to offer a 486 at a 386™ price that includes exclusive Tandon features, as well as the quality that comes from fifteen years of industry experience and an engineer-design team with 16 patents to their credit. That's why the SL 486 is more than just a great buy, it's a great machine.

To start with, we used the Intel® 80486 chip with its built-in numeric coprocessor and 8k memory cache. The cache provides faster memory reads and the coprocessor handles even the most difficult calculations with the utmost speed.

Then, to help maintain the power of a big machine in a little package, we designed it with a Tandon exclusive called the PowerPoster™. It's an intelligent write buffer that accelerates most write operations to RAM at four times the rate of un-enhanced 486's.

To empower this slimline even more, we incorporated another Tandon feature. Our exclusive MIAT™ (Mapper-Integrated AT) chip for greater interpretation and reliability. Then we added the Tandon Memory Mapper, which provides Flex Shadowing of

RAM for faster processor performance. Together, these innovations help to give you one fast machine in one attractive slim case for one really low price.

Of course, with any Tandon Computer you also get the support you'd expect from a 400 million dollar corporation. Like prompt delivery, a one year limited warranty, on-site service, and helpful toll free tech support. We even offer a special leasing program. And if for any reason you're not pleased, you can get a full refund within the first 30 days.

So if you're interested in a high powered, compact, 486 machine that costs about the same as most 386's, call us today and ask about the Tandon SL 486/25 Slimline. Its performance will truly impress you, almost as much as its price.

- 30-Day Money Back Guarantee
- Toll-Free Technical Support
- 1-Year Limited Warranty
- On-Site Service



Tandon SL 486/25 Slimline
SPECIAL OFFER:

\$2,999

Lease: As low as \$105/month.

H A 386 PRICE TAG.

THE TANDON UPGRADE PACKAGE OFFER*

AVAILABLE FOR JUST \$1000.

Includes: 110MB Hard Drive
VGA Color Monitor (640x480 Resolution)
Microsoft® Windows™ 3.0/Mouse

Tandon SL 486/25: \$2,999 • Price includes: system unit, 2MB RAM, 1.2 or 1.44MB diskette drive, VGA monochrome monitor, 16-bit video card, keyboard, power cord, Tandon MS-DOS software and manual, operating and installation manual. • **Options:** 1MB or 2MB memory upgrade kits; additional 1.2MB and 1.44MB diskette drives; 110MB or 200MB IDE hard disk drives; VGA and Super VGA color monitors, 2400 baud modems, network cards, laser printers, Microsoft® Windows™ 3.0 and serial mouse. Additional options and features are available. *Available only with Tandon SL 486/25 systems. **Call for details on our family of Slimline computers.**

CIRCLE 333 ON READER SERVICE CARD

OPTIONS AND CUSTOM CONFIGURATIONS

- Hard Drives, Diskette and Optical Drives
- VGA and Super VGA Monitors
- Modems
- Additional Options Available On All Systems. Please Call.
- Memory Expansion
- Coprocessors

Tandon

TO ORDER DIRECT, CALL NOW:

800-800-8850

FAX 805-529-8408

Tandon reserves the right to amend specifications without notice. Tandon 486, Tandon 386, SL386x, SL 486, LT/286, LT/386x, 386x/N, 286/N, Tandon Tower 386, Tandon Tower 486, PowerPoster, MultiCACHE and MIAT are trademarks of Tandon Corporation. Intel is a registered trademark and 486 and 386 are trademarks of Intel Corporation. All other products or services are identified by the trademarks or service marks of their respective companies. ©1991 Tandon Corporation, Moorpark, CA. Leasing terms vary by system.

Lincoln Logs builds its management information systems with Enable software.



Making things fit is critical for a supplier of custom log homes. That's why Lincoln Logs, of Chestertown, N.Y. chose Enable software.

Enable is the focal point of a multi-branch, 35 user information management system that includes a PC network, an IBM AS400 Minicomputer, and a complex mix of software. Enable functions as a resource manager, establishing connections between Enable Word Processing, Database, Spreadsheet, and several dedicated programs.

Enable's powerful integration feature culminates in a sophisticated customer service program that lets Lincoln Logs track a customer from the inquiry stage to the completion of the log home. Enable will play a major role as Lincoln Logs integrates an automated custom-design process with its administrative functions.

Greg Schwab, Director of Data Processing, chose Enable because it offers a comprehensive system approach to Lincoln Logs information requirements. "One of Enable's real strengths is its customization

capability. We can shape and enhance an information management system specific to a user, or group of users."

Learn how you can build a better management information structure. Call Enable Department M, toll-free, and ask for your Enable building kit and your Enable/OA 4.0 demo disk, featuring new graphical interface, pull-down menus, and desktop tools. Enable Software, 313 Ushers Road, Northway Ten Executive Park, Ballston Lake, NY 12019.

Enable[™]

**Integrated Software
to manage business.**

1-800-888-0684

CIRCLE 386 ON READER SERVICE CARD

Boosting Video Performance



UNDER

Windows 3.0

by M. David Stone

To examine the role video plays in *Windows*, PC Labs tests nine graphics adapters at various resolutions. The results will help you choose the right display system.

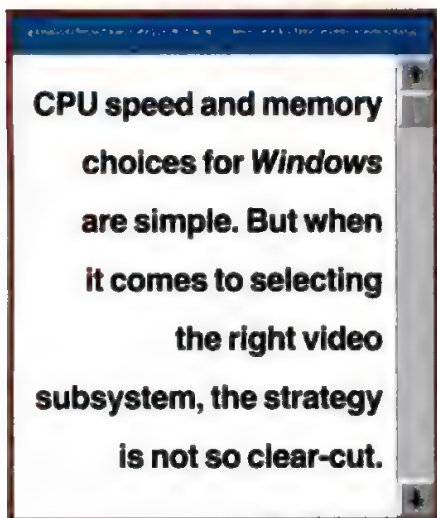
When it comes to CPU speed and memory, the best advice for *Windows* users is simple: Get as much as you can for as little as possible. (We recommend an 80386 with at least 4MB RAM.) But, when it comes to selecting the right video subsystem for *Windows*, the strategy is not so clear-cut.

First, you have a wide choice of modes to work in: VGA, Super VGA, and even 8514/A. Then there's the interface: 8-bit or 16-bit? Should you go with dynamic RAM (DRAM) or special video RAM (VRAM)? Should you look

for a board with a graphics coprocessor, such as Texas Instruments' TMS34010 or IBM's 8514/A? If you're on the Micro Channel architecture (MCA) bus, where IBM's new XGA is also an option, you have to add a 32-bit interface and XGA's own coprocessor to your decision tree.

WHAT WE TESTED

To answer these questions and further explore video performance under *Windows 3.0*, PC Magazine Labs tested a variety of best-selling video boards at different resolutions. We started with two previous Editors' Choice winners: the NEC MultiSync Graphics Engine and the Renaissance



Rendition II (see "1024 Graphics Adapters," April 10, 1990). Then we contacted three of the top market leaders—ATI, Video Seven/Headland Technology, and Western Digital (Paradise)—and asked them to send us several models: their low-end 8-bit, low-end 16-bit, and high-end 16-bit boards. What we got was a group of nine video adapters, which we put through our complete suite of *Windows* performance tests. The test results from this wide sampling of products will help point the way to the best video board for your needs.

Please note that in this story we take an overall look at video performance trends. We're not reviewing the nine tested video boards; instead, we are using them to represent a broad market sampling. Later this year, we'll take an in-depth look at all the Super VGA boards on the market and explore our conclusions further.

Along with this story and the performance test results that accompany it, we've included a glossary to help you with unfamiliar terms ("Coming to Terms with



COMING TO TERMS WITH VIDEO: A Glossary

by M. David Stone

BitBlt: Short for *bit block transfer*, BitBlt is the function that copies a bit-mapped image (a rectangular array of bits that corresponds to the pixels of a graphic image) from a source device to a destination device; for example, from one memory location to another or from memory to screen. Because *Microsoft Windows 3.0* and other GUIs depend heavily on BitBlts for performance, it's essential that video schemes optimized for *Windows*, such as XGA, do a good job of bitblitting.

Character box pixel array: On-screen characters, like the characters from dot matrix printers, are formed from a matrix of pixels, with the number of horizontal and vertical pixels varying with the resolution mode. The character box pixel array defines the matrix devoted to a single character and is described in terms of the number of horizontal pixels by the number of vertical pixels; 9 by 14, for example, in MDA mode.

8514/A or 8514: Introduced in 1987 by IBM as its high-end video implementation, 8514/A offers 256-color 640-by-480 resolution and an interlaced 1,024-by-768 resolution with either 16 or 256 colors. Although technically 8514/A is the card and 8514 refers to the monitor, the "A" is often dropped when discussing the card. Key features include the 8514 graphics coprocessor, which is one of the two most popular choices for coprocessed cards today. IBM is clearly aiming to replace the 8514/A standard with XGA in the Micro Channel world. Still, 8514-compatible boards may survive for some time on the ISA bus.

Flicker: Flicker describes two different effects. True flicker, where the screen seems to blink rapidly on and off, is caused by a slow refresh rate, or low vertical frequency; this means the screen isn't being rewritten quickly enough to fool the eye into seeing a

steady image. The second kind of flicker looks more like a jiggling of horizontal lines and is caused by interlacing. To avoid both kinds of flicker, you need a high vertical frequency (at least 60 Hz but often more) and a noninterlaced video scheme—currently an expensive combination.

Graphics coprocessor: Similar to a math coprocessor in concept, a graphics coprocessor can speed up performance in two ways: It takes over tasks the main processor would otherwise lose time performing, and it is optimized for graphics. Video adapters with graphics coprocessors are expensive compared with those without, but they speed up *Microsoft Windows 3.0* and other graphics operations considerably. Two popular coprocessed products are IBM's 8514/A and Texas Instruments' TMS34010.

Horizontal frequency: The horizontal frequency measures how long it takes a monitor to draw one horizontal line across the screen. Monitors are designed and rated for one or more specific horizontal (and vertical) frequencies. Similarly, video modes are designed for specific frequencies. When you choose a graphics adapter and monitor, the frequencies of both must match. Horizontal frequencies are usually given in kHz.

Interlaced mode: Interlacing is a technique for drawing an image by making two passes. On the first pass, the system draws every other line; on the second pass, it fills in the gaps. Depending on monitor type, lighting, and individual perception, such interlacing often leads to a visible flicker. But monitors that use an interlaced mode at a given resolution will be less expensive than monitors capable of noninterlaced mode for the same resolution.

Noninterlaced mode: Noninterlaced



"GLOSSARY" CONTINUED

video modes draw the image in one pass, going from top to bottom, one line at a time. At any given resolution, noninterlaced video modes are far preferable to interlaced modes, but they are more expensive than their interlaced counterparts.

Refresh rate: The refresh rate indicates how quickly a screen is rewritten in any video mode. It is also called the *vertical frequency*.

Super VGA: Super VGA often refers to any enhancements to VGA—such as more colors or greater resolution—that ensure VGA compatibility. At *PC Magazine*, we use the term more specifically to mean 800-by-600 resolution with 16 colors—the Super VGA recommendation of the Video Electronics Standards Association.

TMS34010: This popular graphics coprocessor from Texas Instruments is one of the leading choices for coprocessed video boards. The 34010 is only the first chip in a promised series; in fact, the second generation—the 34020—is already available on some boards.

Vertical frequency: The vertical frequency—also called the *refresh rate*—indicates how long it takes to draw an entire screenful of lines, from top to bottom. Monitors are designed for specific vertical (and horizontal) frequencies. Similarly, video modes are defined, in part, by specific frequencies. When you are choosing a video card and monitor, the frequencies of both must match.

Vertical frequency is a key factor in determining image flicker. Given a low enough vertical frequency (53 Hz, for example), virtually everyone will see a flicker because the screen isn't being rewritten quickly enough to fool the eye. A high vertical frequency (70 Hz

on a 14-inch monitor) will eliminate the flicker for almost everyone.

VESA (Video Electronics Standards Association): VESA is a consortium of manufacturers formed to establish and maintain industry-wide standards for video cards and monitors. VESA is responsible for establishing the Super VGA recommendations that many manufacturers follow today.

VGA pass-through: This feature, present on the 8514/A and some other high-resolution boards, lets a VGA signal literally pass through the board. The VGA signal originates on a VGA board or motherboard-mounted VGA system and goes to a monitor connected to the high-resolution board. This feature lets you use a single monitor for both VGA and high-resolution levels.

VRAM (video RAM): VRAM is special-purpose RAM with two data paths for access, rather than the one path in conventional RAM. The two paths let a VRAM board handle two functions at once: display refresh and processor access. VRAM doesn't force the system to wait for one function to finish before starting the other, so it permits faster operation for the video subsystem.

XGA: XGA (Extended Graphics Array) is IBM's latest high-resolution video scheme. Introduced along with the PS/2 Models 90 and 95, XGA puts 8514-level and VGA-level resolutions on the same board. Optimized for performance under *Microsoft Windows 3.0*, XGA ships with a *Windows* driver. Although the current IBM implementation is interlaced, the specification does include support for noninterlaced modes. IBM has proposed the XGA spec to VESA, which was still evaluating it when we went to press. ■

M. David Stone is a contributing editor of *PC Magazine*.

Video: A Glossary"), a chart defining video standards ("From MDA to XGA: A Guide to Video Standards"), and a preliminary look at IBM's new XGA scheme ("XGA: IBM's New High-Resolution Spec").

HOW WE TESTED

Clearly, there is a lot you need to consider when choosing a card and monitor. To help define the issues, we examined nine popular graphics boards under *Microsoft Windows*: the Renaissance Rendition II from Appian Technology, the VGABasic-16 and VGAWonder Plus cards from ATI, the MultiSync Graphics Engine from NEC, the Vega VGA, VGA 1024i, and V-RAM VGA cards from Video Seven/Headland Technology, and the Paradise Basic VGA Card and Paradise VGA 1024 Card avail-

Along with this story
and the performance
tests, we've included a
glossary to help you
with unfamiliar terms
and a chart defining
video standards.

able from Western Digital Imaging.

Note that our list includes two coprocessed boards (the MultiSync Graphics Engine and the Rendition II), two 8-bit boards (the Vega VGA and Paradise Basic VGA Card), and one board that depends heavily on video RAM for its performance (the V-RAM VGA). We have included two or more boards from each of three manufacturers to compare results across product lines.

Notably absent from our tests are any of the newly available 8514/A boards. Unfortunately, none of the manufacturers could provide us with such a board in time for this article. Another missing option is Compaq's graphics accelerator, which wasn't available on our Compaq Deskpro 386/25e test-bed machine. Compaq has announced it will include the chip as standard on new systems; it's already in the

Systempros and the high-end 386s.

As the 25-MHz 386 system is now the accepted midlevel business system (with the 20-MHz 386SX quickly becoming entry-level), we tested all these boards in a Compaq Deskpro 386/25e. To provide a baseline for comparison, we also ran the tests on the built-in VGA on the Compaq motherboard. The monitor in all cases was an NEC MultiSync 4D. We chose the 4D because the MultiSync line is the closest thing to a standard among multifrequency monitors, and the 4D is the least expensive model capable of handling all the resolutions we needed.

We considered several important issues when choosing the boards to be tested and the conditions under which to test them. First, we wanted to be able to say something about specific hardware choices: the effect of having a coprocessor (such as the TMS34010), a 16-bit board versus an 8-bit board, VRAM instead of DRAM, and so on. Unfortunately, you can't completely separate the effects of these hardware choices unless you can obtain two identical boards that differ only in one particular, and this opportunity seldom arises. We did the next best thing by testing several sam-



**Most manufacturers
don't include drivers
with their VGA boards
because many
programs come with a
VGA card driver.**

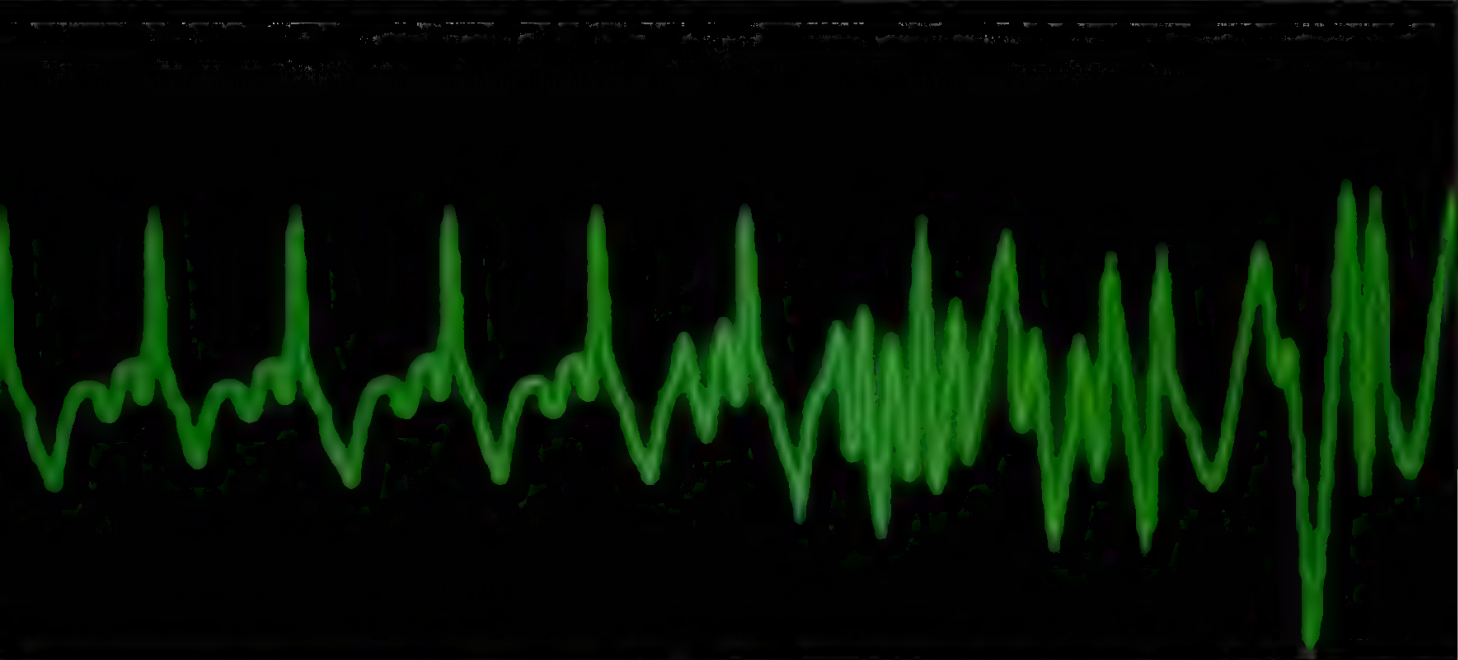
ples and looking for patterns.

A second important goal of our tests was to explore how resolution and the number of colors affected performance, as well as the effect of different generations of drivers. As with hardware, you can't fully separate these software issues from each other. Any given driver defines the number of colors and resolution. And, of

course, two drivers with the same resolution but different color levels may have other differences, too. Here again, we tested multiple samples and looked for consistent patterns.

Choosing the drivers was easy. In most cases, it amounted to testing every *Windows* driver that worked with the board. Most basic VGA boards, including the two we looked at here, come without drivers. Instead, the manufacturers rightly assume that *Windows*, or whatever program you use, will come with a standard VGA card driver. Cards that go beyond VGA come with their own drivers to ensure that you can take advantage of their capabilities. That's true whether they use some proprietary scheme or follow the Super VGA guidelines established by the Video Electronics Standards Association (VESA).

Note that if you plan to move entirely to the *Windows* environment, it doesn't matter whether a board follows an established standard or not, as long as it provides a driver that will work with *Windows*. As a practical matter, however, you'll want a board capable of functioning at least minimally at the DOS level. Typically, this means an adapter that includes VGA com-



Introducing The Norton AntiVirus.™

A computer virus can kill every file in a system. Even an entire hard disk. Which is why you need serious protection. The kind Peter Norton, world-famous for curing IBM PC disk problems, can offer—The Norton AntiVirus for MS-DOS.

It's the most comprehensive virus protection, detection and elimination program you can buy. And the easiest to use.

The Norton AntiVirus protects you against virus infec-

tions BEFORE they enter your system. It works behind the scenes, monitoring and diagnosing any suspicious activity—scanning all types of files faster than any other antiviral software while minimizing false alarms.

It'll detect, and with a touch of a key, remove existing viruses on your hard disks, floppy diskettes and network servers. And with the exclusive 24-hour Virus NewsLine* it

patibility on-board, or has a VGA pass-through feature.

Every card we looked at here included a standard VGA mode, so we tested each card with the standard Windows VGA driver at 640-by-480 resolution showing 16 colors. In addition, some cards provided their own 16-color 640-by-480 drivers, allowing us to compare performance with two equivalent but different drivers. For those cards that provided a 256-color 640-by-480-resolution driver, we tested that as well.

The two most common resolutions above 640 by 480 are 800 by 600 (or Super VGA) and 1,024 by 768 (an entry-level mode for any card that dares to call itself high-resolution). Here again, when cards included drivers for either or both of these modes, we also tested at the higher resolutions.

UNEXPECTED RESULTS

Probably the most intriguing results one will find in any testing situation are the ones that don't match expectations. By this standard, the most interesting result we found is the relationship between resolution and performance. We believed it



**We believed the
relationship between
resolution and
performance would be
fairly straightforward.
It isn't.**

would be fairly straightforward. It isn't.

Higher resolution means more pixels to handle, which should translate to slower performance. At a 800-by-600 resolution, for example, there are 480,000 pixels (800 times 600), compared with 307,200 pixels at 640-by-480 resolution. You might expect this 56 percent pixel increase to create a 56 percent decrease in speed. Similarly,

the jump to 786,432 pixels at a 1,024-by-768 resolution is a 64 percent increase, and you might expect an equivalent drop in performance. This is not what happens.

Looking strictly at 16-color drivers, in the context of boards that don't include coprocessors, there is surprisingly little loss in performance between VGA and Super VGA resolutions. On our tests, there are a few tasks where the boards slow down a few percent, but the overall performance differences simply aren't large enough to be significant.

On the other hand, going from Super VGA to 1,024-by-768 resolution with noncoprocessed boards means taking about 50 percent longer. In some functions the higher resolution takes up to four times as long. The significant exceptions to this rule—among boards without coprocessors—are Video Seven/Headland's V-RAM VGA and the VGA 1024i. Although both boards showed some performance loss in 1,024-by-768 resolution, the drop was less than with other boards. For the V-RAM VGA, the obvious reason is the card's proprietary video RAM. Video Seven attributes the positive findings for the 1024i board to its having been designed

What A Virus Attack Could Do To Your Computer System.

lets you instantly update your protection as new viruses are discovered.

MIS managers can even customize the Norton AntiVirus to suit individual corporate needs, and it's even Windows compatible. Best of all, you can get the Norton AntiVirus for only \$129.95. So, before that fatal attack happens...

SEE YOUR DEALER OR
CALL FOR INFORMATION.
(800) 228-4122 Ext. 600P

SYMANTEC.

Peter Norton
THE PETER NORTON COMPUTING GROUP
CIRCLE 184 ON READER SERVICE CARD





FROM MDA TO XGA: A GUIDE TO VIDEO STANDARDS

To help refresh your memory, here's a handy guide to the last ten years of video standards.

Year of introduction			Resolution	Mode	Colors	Character box pixel array
1981	MDA	(Monochrome Display Adapter)	720 by 350	Text	1	9 by 14
1981	CGA	(Color Graphics Adapter)	640 by 200	Text	16	8 by 8
			320 by 200	Text	16	8 by 8
			160 by 200	Graphics	16	None
			320 by 200	Graphics	4	None
			640 by 200	Graphics	2	None
1982	MGA	(Hercules Monochrome Graphics Adapter)	720 by 350	Text	1	9 by 14
			720 by 348	Graphics	1	None
1984	EGA	(Enhanced Graphics Adapter)	640 by 350	Text	16	8 by 14
			720 by 350	Text	4	9 by 14
			640 by 350	Graphics	16	None
			320 by 200	Graphics	16	None
			640 by 200	Graphics	16	None
			640 by 350	Graphics	16	None
1984	PGA	(Professional Graphics Adapter)	640 by 480	Graphics	256	None
1987	VGA	(Video Graphics Array)	720 by 400	Text	16	9 by 16
			720 by 400	Text	16	9 by 16
			360 by 400	Text	16	9 by 16
			640 by 480	Graphics	16	None
			640 by 480	Graphics	2	None
			320 by 200	Graphics	256	None
1987	MCGA	(Memory Controller Gate Array)	320 by 400	Text	4	8 by 16
			640 by 400	Text	2	8 by 16
			640 by 480	Graphics	2	None
			320 by 200	Graphics	256	None
1989	SUPER VGA	(VESA recommendation)	800 by 600	Graphics *	16	None
1987	8514/A		1,024 by 768	Graphics	16	None
			640 by 480	Graphics	256	None
			1,024 by 768	Graphics	256	None
1990	XGA	(Extended Graphics Array)	640 by 480	Graphics	256	None
			1,024 by 768	Graphics	256	None
			640 by 480	Graphics	65,536	None
			1,056 by 400	Text	16	8 by 16

* Super VGA is a standard only as a graphics mode. Text modes for this resolution exist, but they are always proprietary and therefore made up of varying specifications.

AMERICA'S MOST POPULAR GRAPHICS FORMS SOFTWARE NOW AT A NEW LOW PRICE



Unlike low-end forms utilities that only give you WYSIWYG preview, PerFORM 2.1 is *completely* WYSIWYG, so what you see is what you print. Clear, crisp graphics. Your form appears on your screen the same as the final printed version - eye-catching and easy-to-read. Bitstream fonts and over 100 ready-to-use forms templates are included to get you going right away.

PERFORMANCE AND PRICE

New version 2.1 of PerFORM has the power and features of more expensive forms packages, yet costs only \$149* during this limited-time promotion. Whether you use an old IBM-XT compatible, a brand new '486 or anything in between, PerFORM 2.1 makes the most of your hardware to give you high quality forms. And your forms are fully compatible if you move to PerFORM PRO in the future.

THE CRITICS' CHOICE

In just two years, PerFORM has won the accolades of the editors and the loyalty of thousands of users worldwide. The winner of the major media awards, PerFORM Designer & Filler is recognized as the industry leader in PC forms processing.

FORM YOUR OWN OPINION

Why just believe the critics? Form your own opinion. You can now own the leading PC forms software at a bargain utility price. What's more, new PerFORM 2.1 comes with a **no-risk 60-day money back guarantee**. Hurry! This low price offer won't last long!

CALL TODAY FOR A DEALER NEAR YOU!

1-800-268-6082



PerFORM

PerFORM and PerFORM Designer & Filler are trademarks of Delrina Technology Inc. (c) 1990. Other products are registered trademarks or trade names of their respective owners.

For a limited time only, we're cutting the price of PerFORM 2.1 in half - \$149* (\$175* in Canada). PerFORM 2.1 Designer & Filler saves you time, money and effort in managing business forms.

TAKE THE DRUDGE OUT OF ROUTINE BUSINESS FORMS

PerFORM 2.1 leads the pack in PC forms processing. Design your own forms quickly and easily on your PC instead of sending out. Fill in your forms on-screen instead of by hand. Save filled data in your database. Print only what you need instead of ordering thousands at a time.

WYSIWYG vs. GOBBLEDEGOOK

Some PC forms packages sell for peanuts. And that's exactly what they give you: a gobbledegook screen display that can drive you nutty. With PerFORM, what you see is what you get: great looking forms - fast!

Hardware-compatible modes	Vertical frequency (Hz)	Horizontal frequency (kHz)
None	50	18.43
None	60	15.75
None	60	15.75
None	60	15.75
None	60	15.75
None	60	15.75
MDA	50	18.10
MDA	50	18.10
CGA, MDA	60	21.85
CGA, MDA	60	21.85
CGA, MDA	60	21.85
CGA, MDA	60	21.85
CGA, MDA	60	21.85
CGA, MDA	60	21.85
CGA	60	30.50
CGA, EGA	70	31.50
CGA, EGA	70	31.50
CGA, EGA	70	31.50
CGA, EGA	60	31.50
CGA, EGA	60	31.50
CGA, EGA	70	31.50
CGA, EGA	70	31.50
CGA, EGA	70	31.50
CGA, EGA	70	31.50
VGA, CGA, EGA	56, 60, or 72	35.00, 37.60, or 48.00
VGA pass-through for all	43.48	35.52
VGA	43.48	35.52
VGA	43.48	35.52
VGA	43.48	35.52
VGA	43.48	35.52

Rock Solid Quality,



PC BRAND

Rock Bottom Prices.

PC Brand's Preconfigured Video, Hard Drive Computer Systems.

All Systems Include: Free On-Site Service by TRW*, 5 Year Warranty, 30 Day Money Back Guarantee*, Tech Support BBS, 200 Watt Power Supply, 1.2 Mb, 5.25" and 1.44 Mb, 3.5" Floppy Drives, 1 parallel and 2 Serial Ports, Medium Footprint Desktop Case with Six Disk Drive Bays, 101 Key Click/Tactile Keyboard

286/16 Mono 40MB

- 512K RAM
- 40 Mb/25 Ms Hard Drive
- 12" Monographics Monitor
- Hercules Compatible Monographics Card
- 1.2 or 1.44MB Floppy Drive
- High Resolution Mouse

"Not only does the system perform, look good and have competitive pricing, but it also has the "number-one" rated mail order service and organization behind it. How can you go wrong?"

-Computer Monthly,
286/16 Product Review

\$969

For preconfigured 286/20 system, add \$100

386/SX-16 SuperVGA 40MB

- 2 Mb RAM
- 40 Mb/25 Ms Hard Drive
- 14", 1024 x 768 Super VGA Color Monitor
- 16 bit VGA with 1MB
- High Resolution Mouse

"The PC Brand 386/SX-16 performed at least as well as the far costlier Compaq...We simply began marveling at what is surely the best bargain in personal computing."

-Computer Buyer's Guide,
386 SX-16 Product Review

\$1,874

For preconfigured 386/SX-20 with 16K RAM Cache, add \$100

386/25 Super VGA 80MB

- 4 Mb RAM
- 80 Mb/19 Ms Hard Drive
- 14", 1024 x 768 Super VGA Color Monitor
- 16 bit VGA with 1MB
- High Resolution Mouse

"The Best Low Cost Alternative"... "The PC Brand 386/25 is a fascinating machine. It offers flexible configuration...at a bargain price..." "and the company backs it with what may be the longest warranty on the market..."

-PC Magazine, 386/25 Product Review

\$2,333

For preconfigured 386/25 system with 64K RAM cache, add \$200

386/33 Cache Super VGA 125MB

- 4 Mb RAM
- 125 Mb/19 Ms Hard Drive
- 64K RAM Cache
- 14", 1024 x 768 Super VGA Color Monitor
- 16 bit VGA with 1MB
- High Resolution Mouse



"PC Brand's 386/33 has flawless compatibility, lowest price."

-InfoWorld,
386/33 Product Review

\$2,854

486/25 Super VGA 125MB

- 4 Mb RAM
- 125 Mb/19 Ms Hard Drive
- 14", 1024 x 768 Super VGA Color Monitor
- 16 bit VGA with 1MB
- High Resolution Mouse

"PC Brand is the L.L. Bean of personal computer mail order...it's service and support policies help to insure that."

-Personal Computing,
10 Best Mail Order Companies

\$3,404

486/33 Super VGA 125MB

- 4 Mb RAM
- 125 Mb/19Ms Hard Drive
- 14", 1024 x 768 Super VGA Color Monitor
- 16 bit VGA with 1MB
- High Resolution Mouse

Our 486/33 is guaranteed to satisfy even the hungriest "Power User"-truly a mainframe on a desktop.

\$4,924

Call 1-800-PC Brand Today

PC Brand will customize any system to your exact specifications, with name brand products for vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

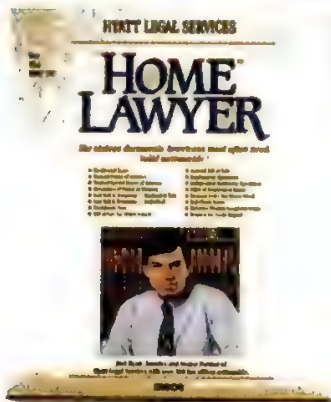
TEL:1-800-722-7263 FAX:1-800-722-7392

PC Brand, Inc. 954 W Washington St., Chicago, IL 60607 International Fax #312-633-2888 International Voice #312-226-5200. We are open Mon thru Fri: 7am to 7pm, Sat 8am to 4 pm Central Time MasterCard, VISA, Discover, PC Brand Direct Advantage MasterCard, Checks and Approved P.O.s are Accepted Prices and specifications subject to change. tTRW National Computer Maintenance Services Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details

*60 Day Return for 386/33 InfoWorld Recommended System

PCM 91-4A

LEGAL PEACE OF MIND



Does your babysitter have the power to authorize emergency medical treatment for your child? Do you "get it in writing" before engaging in those "routine" transactions that can be packed full of surprises? Do you have a current will? (A surprising 7 out of 10 Americans don't.)

Rest assured. Home Lawyer™ lets you use your computer to prepare important personal documents like a medical power of attorney, an independent contractor agreement or a bill of sale to protect you and your family. It brings you the 16 documents Americans most often need--created by Hyatt Legal Services for your home use.

Last Will & Testament - Husband & Wife
Last Will & Testament - Individual
General Power of Attorney
Medical/Special Power of Attorney
Revocation of Power of Attorney
Bill of Sale for Motor Vehicle
Independent Contractor Agreement
Employment Agreement
Request for Credit Report
Bad Check Notice
Residential Lease
Promissory Note
General Bill of Sale
Offer of Employment Letter
Demand Letter for Money Owed
Defective Product Complaint



- Simple question & answer format
- Valid nationwide *
- Built-in flexibility
- Context-sensitive HELP answers
What? When? Why? on screen.
- Professional quality documents
with most printers

* Except Louisiana

For legal peace of mind,
see your local dealer or call Toll-Free to order
Home Lawyer™ at just \$119.95** complete with a
30-day money back guarantee & FREE shipping.
1-800-237-8400 ext. 229

CIRCLE 376 ON READER SERVICE CARD
Requires 256K IBM® PC or compatible, IBM compatible printer,
DOS 2.0 or later. Contains both 5.25" & 3.5" disks.
(c) 1990 MECA Ventures, Inc. & OverDrive Systems, Inc.
**CT residents add 8% sales tax. A00002

with special attention to timing issues. This allows more-efficient memory access and therefore yields better performance.

The lessons here are threefold: First, if you already have a Super VGA board, a Super VGA monitor, and an appropriate Windows driver, use the Super VGA. As long as you're comfortable with the readability, there is no reason you shouldn't, since there is no significant performance loss.

Second, if you don't already have a Super VGA board and you're looking for no more than 800-by-600 resolution with 16 colors, virtually any of these 16-bit Super VGA boards will do the job. Unless you're prepared to spend the money for a monitor that can handle 1,024-by-768 resolution, there's no point in spending extra money on the board.

And third, if you're interested in resolutions higher than 800 by 600, the VRAM on the V-RAM VGA does make a difference. Our tests indicate that the bottleneck



**If you're comfortable
with your present
Windows driver and
Super VGA board and
monitor, there's no
reason you shouldn't
use them.**

for other boards in high-resolution modes is the DRAM, with its single pathway. The advantages of having two VRAM path-



FACT FILE

Applan Technology Inc., 2265 116th Ave. NE, Bellevue, WA 98004; 800-422-7369. BBS number: 206-454-0511. Modem settings: 2,400 bps, 8, N, 1.

Renaissance Revolution II

List Price: 256-color version, \$1,295. VGA daughterboard, \$150.
Requires: VGA-level monitor (for VGA daughterboard) or high-resolution monitor (for resolutions up to 1,024 by 768, noninterlaced), 8- or 16-bit slot.

CIRCLE 427 ON READER SERVICE CARD

ATI Technologies Inc., 3761 Victoria Park Ave., Scarborough, Ontario, Canada M1W 3S2; 416-756-0718. BBS number: 416-756-4591. Modem settings: 1,200, 2,400, 9,600 bps. N, 8, 1.

VGA Basic-16

List Price: \$99.
Requires: VGA-level monitor, 8- or 16-bit slot.
VGA Wonder Plus
List Price: 512K version, \$349.
Requires: MDA, CGA, EGA, VGA, Super VGA, or high-resolution monitor (up to 1,024 by 768, noninterlaced), 8- or 16-bit slot.

CIRCLE 429 ON READER SERVICE CARD

NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 800-826-2255; 708-860-9500. BBS number: 708-860-2602.

Modem settings: 300, 1,200, 2,400 bps; N, 8, 1.
NEC MultiSync Graphics Engine
List Price: \$1,499.
Requires: VGA, Super VGA, or high-resolution monitor (up to 1,024 by 768, noninterlaced), 8- or 16-bit slot.

CIRCLE 429 ON READER SERVICE CARD

Video Seven/Headland Technology Inc., 46221 Landing Pkwy., Fremont, CA 94538; 800-238-0101. 800-962-5700 (in Calif.), 415-623-7857. BBS number: 415-658-0503. Modem settings: 2,400 bps; N, 8, 1.

Vega VGA

List Price: \$247.
Requires: MDA, CGA, EGA, or VGA monitor, 8-bit slot.
VGA 1024i
List Price: With 256K RAM, \$347; with 512K RAM, \$397.

Requires: VGA-level monitor (for VGA resolution) or high-resolution monitor (up to 1,024 by 768, interlaced), 8- or 16-bit slot.

V-RAM VGA

List Price: \$597.
Requires: VGA-level monitor (for VGA resolution) or high-resolution monitor (up to 1,024 by 768, noninterlaced), 8- or 16-bit slot.

CIRCLE 542 ON READER SERVICE CARD

Western Digital Imaging, 800 E. Middlefield Rd., Mountain View, CA 94043; 800-832-4778; 415-960-3353. BBS number: 714-753-1234; modem settings: 1,200, 2,400 bps; N, 8, 1. BBS number: 714-753-1068; modem settings: 9,600, N, 8, 1.

Paradise Basic VGA Card

List Price: \$189.
Requires: VGA-level monitor, 8-bit slot.
Paradise VGA 1024 Card
List Price: 512K version, \$409.
Requires: VGA, Super VGA, or high-resolution monitor (up to 1,024 by 768, interlaced), 8- or 16-bit slot.

CIRCLE 543 ON READER SERVICE CARD



YOUR HARD DISK.



YOUR HARD DISK WITH STACKER.

If you need more megabytes than your hard disk can swallow, don't buy a new drive. Stretch it with Stacker.

Stacker is the fastest, most economical way to safely double your hard disk capacity. Without sacrificing DOS compatibility. It's the new standard in real-time data compression.

- Increase storage 100%
- Compatible with DOS 3.x, 4.x
- Industry's fastest real-time data compression
- Includes disk caching
- Fastest, easiest installation
- Toll-free technical support
- 90-day money-back guarantee

And it's the only product of its kind available in both software and coprocessor versions.

Stacker is fully compatible with Windows 3.0 and all your favorite disk utilities, too. Plus, Stacker includes a powerful disk caching program for added performance.

And when you add the Stacker coprocessor card you also get the fastest data compression in the business.

No wonder there are already over a million satisfied users of Stac's compression technology.

So call today and double your disk capacity tomorrow. You can purchase the Stacker software-only version—perfect for laptops—for only \$129. Or get the entire Stacker high performance system with software and coprocessor card for just \$229.

Order today. Visa, MasterCard, American Express cards accepted.

1-800-522-7822

Or see your local computer/software dealer.

STACKER™

© 1990 Stac Electronics, Carlsbad, CA
Stacker is a trademark and Stac a registered trademark of Stac Electronics

CIRCLE 731 ON READER SERVICE CARD

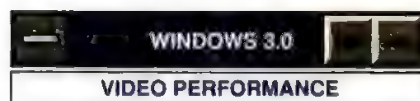
ways show up only in the higher-end modes where you begin to push the capabilities of the board.

Western Digital Imaging says that in upcoming generations of boards, the performance for DRAM will be much improved because the boards will use 4-by-256-kilobit DRAM. And as the 1024i demonstrates, a well-designed DRAM board can get around the significant performance handicaps of its brethren. Even when you take promised increases in DRAM performance into account, however, you're still stuck with spending money on a 1,024-by-768 board as well as a compatible monitor.

THE COLOR FACTOR

Aside from the effect of different resolutions, there was little surprise in our results. For the most part, we simply came up with figures that support the conventional wisdom.

As expected, the extra color depth in a 256-color driver considerably slowed the performance of noncoprocessed boards. In



If you're using a noncoprocessed card and also don't need a rich color palette, don't install a 256-color driver; it will only slow you down.

fact, this is an understatement. For any board, most of the functions in PC Magazine Labs' tests took three to ten times as long with a 256-color driver as with a 16-

color driver at the same resolution.

So if you're using a noncoprocessed graphics board and your applications aren't dependent on a rich palette of colors, don't install a 256-color driver. It won't add anything to your spreadsheet or word processor, but it will slow you down. In fact, if you have just one or two applications that use 256 colors, you're well advised to install the necessary driver on an as-needed basis.

THE COPROCESSOR CONUNDRUM VERSUS VRAM

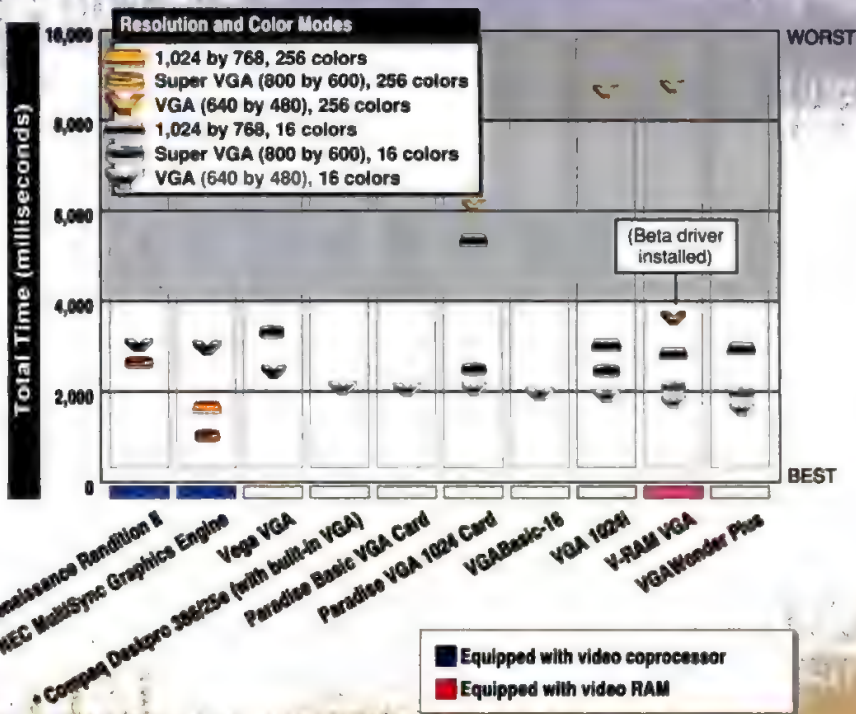
If continually switching video drivers isn't your idea of fun, your best alternative is to get a board with a coprocessor. In our tests, not only did the coprocessed boards outperform their noncoprocessed cousins in every instance, but for many functions they were ten times as fast. Note that this performance increase holds true even for a coprocessed board in 256-color 1,024-by-768 mode compared with a noncoprocessed board at 640 by 480 with 16 colors.

Interestingly, our tests do *not* show a

VIDEO PERFORMANCE UNDER WINDOWS 3.0

To explore video performance under Microsoft Windows 3.0, PC Magazine Labs ran nine video boards and Compaq's built-in VGA through our complete Windows benchmark test suite. An overview of the results indicates some important performance trends.

With a noncoprocessed board, moving from VGA to Super VGA results in a slight performance hit, but the improved display quality is well worth the cost in speed. But going from Super VGA to 1,024-by-768 resolution creates a significant slowdown that may outweigh the improvement in display quality. Coprocessed boards, however, provide acceptable performance at all resolutions and color levels. Finally, by testing one board (the V-RAM VGA) with two generations of the same driver, we found dramatic differences in performance, underscoring the importance of getting the newest driver.



* Reported for comparison.



significant difference between 800-by-600 and 1,024-by-768 resolutions on NEC's coprocessed board. So if you have a coprocessor—or can get one—you can probably run it at the highest resolutions and color depths we tested without lowering performance. Admittedly, performance may well be affected at still higher resolutions.

Also keep in mind that the slower your system, the more it will benefit from a coprocessed board. If you're not prepared to move to a faster system, the benefits of upgrading to a coprocessed board will be proportionately greater. And when you finally

We tested the video boards for this story in a Compaq Deskpro 386/25e using DOS 4.01 and Microsoft Windows 3.0. Each board was tested at standard VGA resolution (640 by 480) with 16 colors using the standard VGA Windows driver to obtain a baseline comparison. Also for comparison, we've included the results for the built-in VGA on the Deskpro's motherboard using the standard Windows driver. Each board was then tested at other resolutions (800 by 600 and 1,024 by 768) with 16- and 256-color drivers, if available.

The boards ran all the tests in PC Magazine Labs' Windows benchmark test suite five times. For each board, we averaged each test's five results and then added up the averages to arrive at the times reported here. We disabled the output to the screen, and to eliminate the mouse cursor, we left the mouse uninstalled. (For a full description of PC Labs' Windows benchmark test, see page 172 in the April 10, 1990, issue.)

The results of our video tests don't allow direct comparisons between individual boards because we're not reporting specific test results, but merely an averaged total of all results combined. Think of this as an overall comparison index. The results let us draw general conclusions about the boards' performance characteristics at different resolutions and color levels.

The first and most surprising result is that there is no direct correlation between resolution and performance. Even though there is a 56 percent increase in the number of pixels being put on the screen when you go from VGA to Super VGA, there was an average increase of only 24.5 percent in the test times for the noncoprocessed video boards (which included all of the boards except the Renaissance Rendition II and NEC MultiSync Graphics Engine). The slight increase in total time at 800-by-600 resolution is more than offset by the improvement in image quality.

By contrast, going from Super VGA to 1,024-by-768 resolution, where there is a 64 percent increase in the number of on-screen pixels, average performance times were almost 50 percent longer. So while the jump from VGA to Super VGA may be well worth the slight performance hit, going all the way to 1,024 by 768 may prove too sluggish.

Significant exceptions to this trend were

do upgrade, you can move the board and monitor to your new system.

What if coprocessed boards are too rich for your budget (and they might be, since they cost about three times as much as their noncoprocessed competition), but your applications require the 256-color drivers? You might want to consider a VRAM board as a price/performance compromise. Our results with Video Seven/Headland's V-RAM VGA (using the beta driver) show a clear performance loss in going from 16 to 256 colors, but on most functions the performance degradation is dramatically less than it is with the noncoprocessed DRAM boards.

OUTDATED DRIVERS

Another predictable conclusion that meets expectations is that specific drivers can have an effect on performance. This is an effect we've seen before when testing video cards (see "1024 Graphics Adapters," April 10, 1990). In this round of tests, the

the V-RAM VGA and VGA 1024i cards, both from Video Seven/Headland Technology. For the V-RAM VGA board, performance times increased by only 17 percent going from VGA to Super VGA resolution, and then increased by only 28 percent going from Super VGA to 1,024-by-768 resolution. The relatively flat performance curve you see as you climb up the resolution ladder can be attributed to the video RAM, whose performance benefits become more pronounced at higher resolutions.

As for the VGA 1024i board, it experienced a 29 percent increase in performance time going from VGA to Super VGA, but only a 14 percent increase in performance time going from Super VGA to 1,024 by 768, making it the only tested board to display a larger increase in performance time in the jump from VGA to Super VGA. According to Video Seven, the controller chip on the VGA1024i is designed with efficient memory access in mind and so can handle the jump from Super VGA to 1,024 by 768 with aplomb.

Coprocessed boards outdistanced their noncoprocessed cousins' VGA performance although they ran at a higher resolution and greater color depth. In fact, because of the advantageous combination of the hi-res driver and the coprocessor chip set, the tested coprocessed boards ran faster in Super VGA and 1,024-by-768 modes than in VGA mode. When running VGA, these boards do not use the graphics coprocessors, relying instead on the boards' standard (and slower) chip sets. With a coprocessed video board, the advantages are clear: The main processor is excused from many of the graphics manipulation tasks; this greatly improves overall system throughput. Additionally, resolution

and color are no longer an issue, as a graphics coprocessor provides a sufficient level of performance to permit running the maximum resolution and number of colors without a significant slowdown.

We also found, predictably and without exception, that noncoprocessed display boards took significantly longer to perform the tests in 256-color mode at any resolution than to use the 16-color counterpart. The slowdown is caused by the bit plane operations required during BitBlt. This means that if you are a Microsoft Windows user using conventional business applications (like Microsoft Excel or Word for Windows) that don't require a 256-color driver, you should choose a 16-color mode over the deep color. If you really need deep color for specific applications, then load the 256-color driver only when you need it and reload the 16-color version when you're done.

The final question (especially important for Windows users) is how efficiently the driver is programmed. We were able to test the next-generation beta version of the 256-color 640-by-480 driver for the V-RAM VGA board. (Because the product is unreleased, we have not included the results in the our graph.) This driver was optimized to perform BitBlt more efficiently (where the major overhead is involved for deep-color modes). With the beta driver installed, the board performed our tests in 41 percent of the time the board required with the current version of the driver. Conclusion: Driver programming is one of the most important factors affecting video performance under Windows. Therefore, you should check with the video board manufacturer on a regular basis to ensure that you have the latest version of the Windows driver available for your video board.

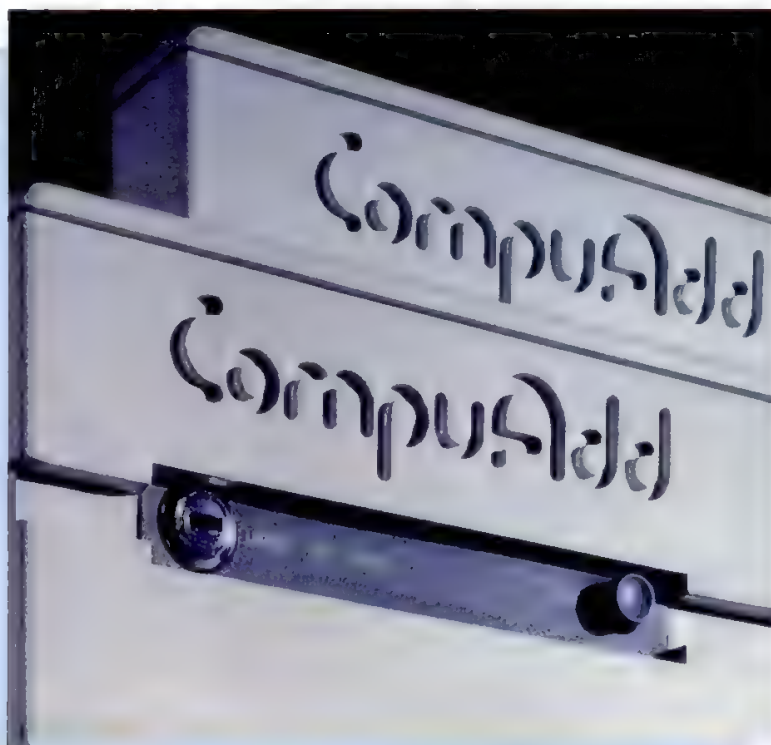
The slower your system, the more it will benefit from a coprocessed board. If you're not prepared to move to a faster system, the benefits of upgrading to a coprocessed board will be proportionally greater.

COMPUADD 325

STAR PLAYER

"The CompuAdd 325 deserves a spot on anyone's evaluation list."

PC World, July 1990



Additional drives and monitor optional

\$1695 64834
Lease as low as \$62/mo.

CompuAdd's 25MHz 386DX is a heavy hitter!

The CompuAdd 325 can be the star player in your office! Used as a standalone workstation, CompuAdd's 25MHz 386DX blazes through Windows applications, spreadsheets, graphics and CAD. Load it up with multiple disk drives, a tape drive and the full 16MB of RAM, and you have an

excellent network server! The basic 325 comes with 1MB DRAM, 32KB

high-speed static RAM cache and your choice of 3.5" or 5.25" diskette drive. Plus you get FREE CompuAdd Windows 3.0 (\$149 value), FREE CompuAdd MS-DOS 4.01 (\$89 value), FREE Microsoft Working Models and a FREE CompuAdd mouse (\$24.95 value). Choose optional monitors, hard drives and memory upgrades to suit your taste!

Call today and sign up a star — the CompuAdd 325!

325 Monitor and Hard Drive Options

	MGA	CVGA
40MB (28ms)	64973 - \$2259	64842 - \$2589
80MB (19ms)	64974 - \$2529	64843 - \$2859
110MB (19ms)	64975 - \$2629	64844 - \$2959
320MB (18ms)	64976 - \$3589	64845 - \$3919



Call 800-456-3660

Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

🇨🇦 800-387-3266 🇩🇪 95-800-010-0401 🇬🇧 0800-373535 🇩🇪 0130-6009 🇫🇷 140-364-675

COMPUADD DX SUCCESS KIT

ALL STAR TEAM

"Few manufacturers would do what CompuAdd does: it takes DOS and Windows and installs them on your system's hard disk, configuring everything so that it will run right out of the box."

PC Magazine, July 1990



Additional drives and color monitor optional

\$2295 66674
Lease as low as \$72/mo.

System, monitor, printer, software, mouse — all at one low price — a sure winner!

CompuAdd's DX Success Kit combines star players into an All-Star Team! The CompuAdd DX Success Kit features a powerful 25MHz 386DX, the CompuAdd 325, complete with 40MB hard drive that *PC Magazine* says delivers "excellent disk performance." CompuAdd's top-of-the-line kit also includes a high-performance MGA monitor and a Panasonic KX-P1180 printer — *PC Magazine* Editors' Choice! Plus you

get FREE CompuAdd Windows 3.0 (\$149 value), FREE CompuAdd MS-DOS 4.01 (\$89 value), FREE Microsoft Working Models and a FREE CompuAdd mouse (\$24.95 value).

Now there's a team you can win with! Call today and order CompuAdd's DX Success Kit!

DX Success Kit Monitor and Printer Options*

	Panasonic KX-P1180 9-pin Printer	Panasonic KX-P1124 24-pin Printer
MGA	66674 - \$2295	66686 - \$2435
CVGA	66680 - \$2625	66692 - \$2765

*Call for details on 80MB hard drive upgrade

CompuAdd®

Customer driven, by design.™

12303 Technology, Austin, Texas 78727

We accept MasterCard, VISA, money orders, certified checks and personal checks (please allow ten days for processing). CDDs (\$50 minimum order), company and institutional purchase orders (minimum initial purchase \$500, thereafter \$50), and wire transfers. Please add 2% to all purchases for shipping and handling (minimum \$3, shipping outside the continental United States will increase cost). Add 6% (or shipping and handling to APO/FPO addresses (minimum \$10). Please add appropriate local sales tax. Thirty-day money-back guarantee does not include return freight or shipping and handling. Opened software, videotapes, other consumables and shipping costs are nonrefundable. All return items must be accompanied by a return merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors. Call 800-666-1872 for a copy of CompuAdd's complete warranty.

CompuAdd's Lowest

*If you're a bargain hunter, CompuAdd's 316s
will make your heart beat faster."*

— PC World, August 1990



Additional drives and monitor optional

\$995

64787

Lease as low as \$40/mo.

Now you can get CompuAdd's 16MHz 386SX at a great bargain!

When your computing needs are ambitious but your budget and space are modest, the low profile CompuAdd 316s is a guaranteed best buy! Start with the basic 16MHz 386SX system sporting 1MB DRAM and

your choice of 3.5" or 5.25" diskette drive. Select from a variety of optional

hard drive and monitor upgrades to customize your system.

Want more speed? Choose our fast 20MHz 386SX — the CompuAdd 320s. Call for pricing.

Call today for a great deal on the technology *PC Magazine* called "perfect for entry-level computer users in today's corporate market."

316s Monitor and Hard Drive Options

	MGA	CVGA
40MB (28ms)	64788 - \$1559	64793 - \$1889
80MB (19ms)	64789 - \$1829	64794 - \$2159
110MB (19ms)	64790 - \$1929	64795 - \$2259



Call 800-456-3660

Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

Prices Ever on 386SX!

*"There just isn't a better chip on the market than the 386,
and the 386SX is the lowest-cost model available..."*

— PC Magazine, 1/30/90



Additional drives and color monitor optional

\$1689 66314
Lease as low as \$62/mo.

The CompuAdd SX Success Kit has been one of our *best sellers* since the day we introduced it! And we just dropped the price over \$200!

The SX Success Kit combines the CompuAdd 316s with a 40MB hard drive, a high-performance MGA monitor and a Panasonic KX-P1180 printer — *PC Magazine* Editors' Choice! Plus CompuAdd preloads your hard drive with **FREE CompuAdd Windows 3.0 (\$149 value)**, **FREE CompuAdd MS-DOS 4.01 (\$89 value)** and **FREE Microsoft Working Models!** Plug in your **FREE**

CompuAdd mouse (\$24.95 value), and you're ready to work right out of the box!

Don't miss these incredible savings on CompuAdd's best-selling plug-and-compute kit. And get a top-notch 386SX system from CompuAdd!

SX Success Kit Monitor and Printer Options*			
	Panasonic KX-P1180 9-pin Printer	Panasonic KX-P1124 24-pin Printer	
MGA	66314 - \$1689	66329 - \$1835	
CVGA	66318 - \$2025	66331 - \$2165	
(*Call for details on 80MB hard drive upgrade.)			

CompuAdd
Customer driven, by design.™
12303 Technology, Austin, Texas 78727

We accept MasterCard, VISA, money orders, certified checks and personal checks (please allow ten days for processing). CODs (\$30 minimum order), company and institutional purchase orders (minimum initial purchase \$500, thereafter \$50), and wire transfers. Please add 2% to all purchases for shipping and handling (minimum \$3 shipping outside the continental United States will increase cost). Add 8% for shipping and handling to APO/FPO addresses (minimum \$10). Please add appropriate local sales tax. Thirty-day money-back guarantee does not include return freight or shipping and handling. Opened software, videotapes, other consumables and shipping costs are nonrefundable. All return items must be accompanied by a return merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors. Call 800-666-1872 for a copy of CompuAdd's complete warranty.



XGA: IBM's New Hi-Res Spec

Is XGA, IBM's new high-resolution scheme, the video standard of the future? For MCA users, it's an important development, but the ISA and EISA crowd may have to wait a long time.

by M. David Stone

When IBM launched its new 486-based PS/2s, it also unveiled a new specification for high-resolution video, called XGA (for Extended Graphics Array). Optimized for use with graphical environments, XGA provides 1,024-by-768 resolution and a high-performance VGA mode. What's disappointing about XGA is its present confinement to the Micro Channel architecture (MCA) and the fact that like its predecessor, the 8514/A, it's interlaced. And like the 8514/A, the XGA specs reveal potential support for noninterlaced modes.

XGA is either a clear step forward, a minor consolidation, or a little of both. If you drive an MCA bus to work, then XGA is of real importance right now. If you're on the ISA or EISA line, then it's only potentially important and for now merely merits the consideration you'd give to any new Big Blue-backed technology. At this writing, it's not clear that XGA will ever make its way to any bus besides MCA.

WHAT IS XGA?

Ever since the introduction of EGA and VGA in 1984, IBM has offered two levels of video: one for the mainstream and one for the high-resolution market. By placing both VGA and high-resolution modes on the same board, XGA ends that division, or at least redefines the mainstream to include 1,024-by-768 resolution. As a matter of fact,

that's almost all XGA does.

XGA has a split personality; besides having XGA capabilities, each board can repress all its high-end features and act as a regular 16-bit VGA board. In this VGA hardware-emulation mode, the board is compatible with 16-bit VGA, right down to the register level; it should work with virtually any software you already have for VGA. With XGA fully enabled, it offers four additional video modes. The 256-color 640-by-480 mode is equivalent to VGA resolution (with more colors) but technically is not VGA. Similarly, the 256-color 1,024-by-768 mode is equivalent to 8514/A resolution. Also included are a 132-column text mode, which is of little interest to *Microsoft Windows* users, and a 640-by-480 deep-color mode that can show 65,536 colors at one time.

XGA is not directly hardware-compatible with 8514/A. The 8514/A standard was engineered to excel at line-drawing applications such as CAD programs. XGA was optimized for graphical user interfaces (GUIs) such as *Windows*, and it can be called a BitBlt device. Instead of being good at drawing lines, like 8514/A, XGA is meant to move blocks of bits (a window, for example).

XGA does offer quasi-compatibility with 8514 through its adapter interface (AI), a DOS device driver. Since XGA's AI is a superset of 8514's AI, any programs that work with the 8514 AI will also work with XGA. IBM has always urged writing to the 8514 AI to ensure such compatibility. The problem is that many people don't, because writing to the hardware yields faster performance.

XGA ENHANCES WINDOWS

For *Windows* programs, compatibility issues are academic because XGA ships with *Windows* drivers, as well as drivers for *AutoCAD* and for the Presentation Manager in OS/2 1.2 and 1.3. (IBM's drivers are written directly to the hardware, for better performance.) Be aware that the *Windows* drivers are only for XGA's 256-color modes. At the time of this writing, there is no support for the

65,536-shade deep-color mode. But with IBM behind it, this will probably become the standard approach.

In addition to deep color, XGA brings one other item to the *Windows* table: performance. IBM claims that XGA can handle *Windows* tasks up to twice as fast as IBM's VGA. On our tests, we also found that XGA performance remains almost the same at all levels of resolution, losing only a few percent at each step from standard VGA to the 256-color 1,024-by-768 mode.

Yet performance is also where most ISA users will begin to yawn. Interestingly, the coprocessed NEC MultiSync Graphics Engine (an ISA device) running on a 25-MHz 80386 machine yielded overall performance that was essentially identical to XGA on a 25-MHz MCA 80486 system. The obvious conclusion is that XGA represents a real performance gain for Micro Channel-based systems, but it's nothing that ISA-based systems can't compete against.

XGA AS A FUTURE STANDARD

One of the more interesting questions about XGA is whether it will become—or even can become—a pervasive standard. Significantly, this is the first IBM video scheme to take advantage of MCA. Whether in the motherboard version used in the PS/2 Model 90 or the card version that we tested in the PS/2 Model 95, XGA offers a 32-bit interface. It also takes advantage of bus mastering, meaning that XGA's graphics coprocessor can take over the system on an as-needed basis. (For more information, see "IBM PS/2 Models 90 and 95: True 486 Power at Last" in this issue.)

These two features are partly responsible for XGA's performance. They are also intimately tied to the MCA bus. By definition, ISA is limited to a 16-bit interface. And while the original AT was designed for one bus-mastering device, there are questions about how well it would work. Of course, EISA allows both a 32-bit interface and bus mastering, but the EISA bus mastering

is different from the MCA scheme.

In fact, XGA is so tied to the MCA bus that it might need a different driver for each of the three buses—an issue that several video board manufacturers pointed out to us independently. If that turns out to be so, you would effectively have three separate standards in any case, even if you call all of them XGA.

It is still too soon to tell whether or not the rest of the industry will accept XGA as a standard. Since announcing XGA, IBM has joined VESA and disclosed the specs with newfound openness. At the time of this writing, however, the consortium had no official response to XGA. Most of the video board manufacturers who spoke to us are actively looking into XGA.

IS IT WORTHWHILE?

An even more interesting question is whether XGA is worth having as a standard. In its current incarnation, XGA's 1,024-by-768 resolution is interlaced. This interlacing results in an annoying

flicker that will dissuade most users from going to the higher resolution.

Competing board makers already offer 8514-compatible boards with noninterlaced 1,024-by-768 resolution. These manufacturers say that their XGA-compatible boards, when they come, will also offer a noninterlaced mode. But the most optimistic prediction anyone would give us for the arrival date of such a board was about a year from now.

One glaring oversight in XGA is the lack of a midrange resolution. As amply demonstrated by the other boards we looked at for this article, a non-flickering, noninterlaced 800-by-600 resolution can show significantly more information on a *Windows* screen than VGA can, at only a moderate increase in monitor price. And the more information you can see in *Windows* at once, the better. When we asked why XGA has no 800-by-600 mode, IBM's response was that this mode was

“already addressed by other vendors.”

A final point about XGA—or any other video scheme—is that video standards are not as important in *Windows* as in DOS. If you'll be doing all or most of your work in *Windows* programs, you only need a *Windows* driver for the resolution you want. Within the context of *Windows*, then, XGA is on the same footing as any other video board with a high-performance graphics coprocessor. And whether XGA will become a wider standard isn't really an issue. ■



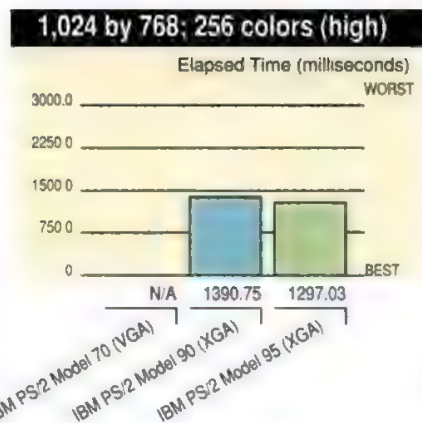
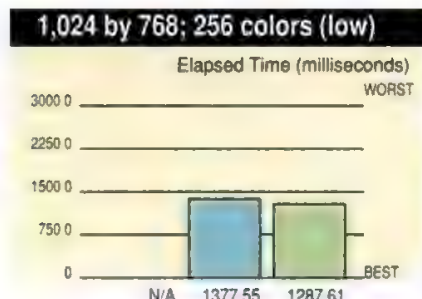
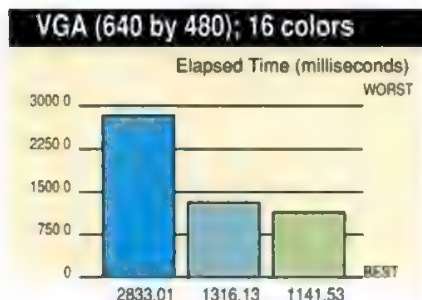
AVERAGE SCORES ON THE WINDOWS PERFORMANCE TEST SUITE: XGA VS. VGA

XGA performed all of PC Magazine Labs' *Windows* performance tests in half the time of standard VGA, substantiating IBM's claims. But XGA's performance increase wasn't our only finding. Unlike the other boards tested for this article, the XGA Display Adapter/A performed as well in high-resolution modes as it did in VGA. The only difference between XGA's low and high 1,024-by-768 modes, tested on the IBM Color Display 8515, was in font handling, and this had little impact on the overall test time.

We tested XGA on the IBM PS/2 Model 90 (with a 25-MHz 486 installed) and the IBM PS/2 Model 95 (with a 33-MHz 486 installed), in both cases using the IBM 8515 Color Display. For the sake of comparison, we tested VGA on the IBM PS/2 Model 70. Results are an average of all of the separate test scores in the suite. (For a full description of PC Magazine Labs' *Windows* performance tests, see page 172 in the April 10, 1990, issue.)

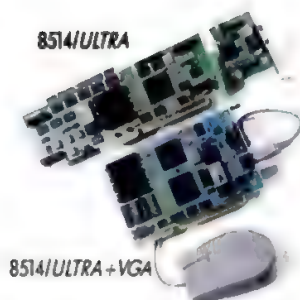
* Reported for comparison.

N/A—Not applicable: VGA is not capable of 1,024-by-768 resolution.



A list of all the things you can do waiting for ATI's new 8514/ULTRA to open Windows.

① BLINK



Don't blink now! Keep both eyes open or you may miss the revolutionary new way of looking at Windows.*

For openers, nothing matches the 8514/ULTRA† for speed. Other cards claim they're fastest, but don't let them pull the wool over your eyes.

The 8514/ULTRA runs Windows 24 times faster than Super-VGA cards*. And five times faster than TI 34010† cards*. It has the power to deliver 386 graphics performance on a 286 machine, and then some. So you don't have to spend big bucks to upgrade your system, when the 8514/ULTRA does more for a lot less.

Like nothing you've seen before.

The 8514/ULTRA delivers high resolution and eye-popping detail. With 70Hz non-interlaced display, flicker-free graphics come alive in brilliant 1024x768 resolution, and up to 256 colors.

True laser print for the screen.

Everyone talks about WYSIWYG. Only the 8514/ULTRA delivers it. ATI's remarkable CRYSTAL Fonts† scale and display Windows text in true laser quality – right on the screen. That's equivalent to 3200x2400 resolution! So even type as tiny as 6-point is clearly legible. Don't waste time and money printing and proofing page-after-page. The 8514/ULTRA lets you do it accurately on-screen.

Plus, it's register compatible with IBM's 8514/A† and software compatible with XGA† cards. And with our innovative "Flippy" design, you get Micro Channel† and AT-bus support on a single card.

The 8514/ULTRA is also available with an integrated VGAWONDER+† controller and Microsoft† compatible bus mouse.

Why not let the 8514/ULTRA open new Windows of productivity – in the blink of an eye.

Priced from \$599.**

For more information, contact your supplier, or:

ATI Technologies Inc.
3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2
Tel: (416) 756-0718
Fax: (416) 756-0720



ATI's Family of Products includes: VGAWONDER+ • VGAEDGE-16 • VGABASIC-16 • 9600etc/e • 2400etc/e • 2400etc/i

*Average speed based on PC Magazine's WINBENCH V1.1 Windows benchmark test. Results available upon request. **Suggested retail price for 512K model. 1MB versions also available. Dealers may sell for less. Copyright © 1991 ATI Technologies Inc. †Trademarks are registered by their respective companies.

CIRCLE 540 ON READER SERVICE CARD

difference shows best on the V-RAM VGA card.

To see the difference a driver can make, we tested the V-RAM VGA board with both the current driver and the next-generation beta version. The performance difference was dramatic; Some functions in the beta driver sped up by a factor of 25 (although a few functions slowed down slightly, too). Clearly, a well-written driver can make all the difference for performance under *Windows*.

No matter what board you have, be sure to stay up to date with your drivers. Even if the performance improvements from one generation to the next are only a few percent, every little bit helps. Many video board manufacturers have an on-line BBS or other service for supplying news of up-to-date drivers.



chip set that was specifically designed for 16-bit operation. By contrast, Western Digital was not surprised that both of its boards performed similarly with the standard VGA driver. According to this company, both boards operate essentially as 8-bit boards for 16-color drivers, and the 16-bit board takes advantage of its 16-bit interface only with its own proprietary drivers.

Given the same chip set on an 8-bit and a 16-bit board, you will generally get the same performance at 640-by-480 resolution with 16 colors. But different chip sets mean different performance at any resolution.

WHAT TO THINK ABOUT WHEN YOU BUY
Keep in mind that performance is not the

No matter what board you have, be sure to stay up to date with your drivers. A well-written one can improve performance under *Windows* dramatically. During testing with a next-generation beta driver, some functions sped up by a factor of 25.

8-BIT VERSUS 16-BIT

We found different results when comparing 8-bit boards with their 16-bit counterparts. Both of the 8-bit boards we looked at are basic VGA-compatible boards that use the standard *Windows* driver, so the only comparison between 8-bit and 16-bit is for 640-by-480 resolution with 16 colors.

As you might expect, Video Seven's 8-bit Vega VGA and its 16-bit VGA 1024i showed marked differences with the standard *Windows* driver. The Vega VGA took anywhere from 20 to 100 percent longer, depending on the function being tested. Yet, Western Digital's 8-bit Paradise Basic VGA Card performed almost identically to its 16-bit VGA 1024 Card cousin.

The difference in performance for the Vega cards seems to come from some factor other than 8-bit versus 16-bit interfaces. Video Seven confirmed this: The chip set on the 8-bit board dates back to 1987, while the 16-bit board uses a new

only issue when you are choosing a video card and monitor. In fact, there are three relevant considerations: price, performance, and perception. Price, of course, is the most straightforward; it gets tricky when you weigh all three against each other. Also, performance and perception aren't nearly as well defined as price, and they end up blurring together.

At first glance, performance seems to boil down to a simple question of speed. But the real definition of speed involves not only the board but the conditions it works under. This means that before you can even consider hardware performance issues, you have to make some choices concerning function. Most important, you have to pick the resolution and the color capabilities you need.

Typical resolutions, of course, include 640 by 480 (VGA), 800 by 600 (Super VGA), and 1,024 by 768 (top resolution for 8514, XGA, and many proprietary

New!

"The World's Most Accurate Mouse"



Sleek, dependable and compatible. The PC Mouse III from Mouse Systems.

Pin-point digitizer accuracy using patented M5 optics. Supports Microsoft[™], MSC, and PS/2 protocols. 100% hardware and software compatibility guarantee. True lifetime warranty. Get your hand on the world's most accurate mouse today!



Special Introductory Offer

Buy a PC Mouse III and receive a free copy of Power Panel[™], the ultimate DOS utility shell. (PC Magazine Editor's Choice, June 12, 1990.)



47505 Seabridge Drive
Fremont, CA 94538
(415) 656-1117

The following are trademarks of their respective companies: PC Mouse III, Power Panel, Mouse Systems Corporation; Microsoft, Microsoft Corporation; PS/2, IBM.

CIRCLE 142 ON READER SERVICE CARD

"...simply stunning and incredibly fast!"

"highly recommended" by John Dvorak, Inside Track, PC Magazine, Nov. 13, 1990

PC Magazine's Editors' Personal Best 1990

Byte's Best Products of 1990, Award of Merit

PC World's Best Buys in Windows Hardware Optimal Workstation

**Here's what the experts are saying
about the hottest high performance
graphics board available...
the Hercules Graphics Station Card!**

"At \$1,024, the Hercules Graphics Station Card is state of the art at an exceptional price."

Info World, Hercules' 34010 Graphics Board is State of the Art. Eric Azinger. Sept. 3, 1990

"...1024 x 768 non-interlaced 256 colour mode is the only way Windows should ever be run."

Personal Computer World, Guy Swarbrick, Hercules Graphics Station Card, June 1990, UK

"If you do a lot of different kinds of graphics but don't want to spend too much, the Graphics Station Card is for you. Highly recommended."

CADalyst, Ralph Grabowski, August 1990

"The Hercules Graphics Station Card combines an extraordinary set of features designed to handle your most...well...*Herculean* graphics tasks."

PC Magazine, Tom Unger, Best of 1990, January 15, 1991

"...Hercules will have proved, twice, that you don't have to be IBM to set standards."

Personal Computer World, Guy Swarbrick, Hercules Graphics Station Card, June 1990, UK

To find out where you can buy your Hercules Graphics Station Card, call 800 532-0600, ext. 743.

For People With High Standards!

Hercules

CIRCLE 118 ON READER SERVICE CARD

schemes). Be aware that while these are the three most popular resolutions there are other possible choices, including some that are even higher—1,280 by 1,024, for example. Color capabilities typically run from a 16-color minimum to 256-color maximum. Here again, there are other possibilities, including 65,536 and 262,144.



They promise to become the new mainstream monitor size, and we'll be doing a roundup of them in an upcoming issue. Also, when making your new monitor decision, you should be aware of some other issues that haven't been important to mainstream users until now. In particular,

Perceptual issues are tricky. For instance, going to a higher resolution in *Windows* doesn't give you same-size images in sharper detail. Rather, it yields smaller images in the same detail you started with, including smaller icons and fonts.

These functional decisions actually come under the heading of perceptual issues. They're important when you're dealing with performance questions because performance varies with the level of functionality. For example, a particular board or class of board may be far faster than another in 256-color mode. But if all you're using is word processors, spreadsheets, or other software that doesn't need more than 16 colors, you shouldn't care about 256-color performance anyway.

Perceptual issues are tricky because they're partly a matter of personal taste, partly a matter of individual physiology, and partly a matter of environment. For example, going to a higher resolution in *Windows* doesn't give you same-size images in sharper detail. Rather, it yields smaller images in the same detail you started with—including smaller icons and smaller fonts.

Depending on your work habits and the quality of your eyesight, you may prefer a higher resolution on, say, a 14-inch monitor because it lets you see more at once. Someone else may prefer the lower resolution because it produces larger, easier-to-read text. Yet, given a 20-inch monitor, you both might prefer the higher resolution.

By the way, if you're buying a new monitor, take a peek at the new 16- and 17-inch-diagonal midsize displays available.

there's the question of vertical frequency.

DEALING WITH SCREEN FLICKER

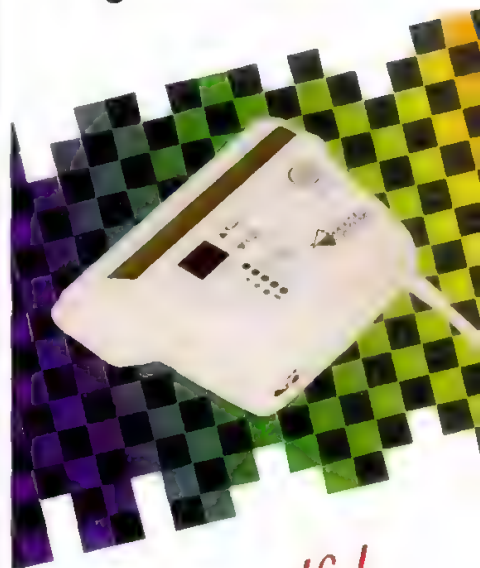
Video boards, like television screens, paint a picture on the display one frame at a time, going from top to bottom. In general, the process can be defined in terms of the horizontal frequency (the time it takes to sweep across the screen once to draw a horizontal line) and the vertical frequency (the time it takes to draw the entire screenful of lines, from top to bottom).

Any video scheme, whether a proprietary board or a widespread standard, has a specific horizontal and vertical frequency for any resolution. On a given board, these can be the same for all resolutions, or can vary from one resolution to another. For any monitor to work with a particular board, it needs to match its horizontal and vertical frequencies to the frequencies the board produces. Multifrequency monitors, such as the NEC MultiSync series, can match more than one set of horizontal and vertical frequencies.

Obviously, the horizontal and vertical frequencies are related; the longer it takes to write each line on the screen, the longer it will take to write the whole screen. But only the vertical frequency becomes an issue when choosing a video system's components.

For VGA, vertical frequency isn't a real concern, except that you need a monitor

PageBrush/Color



*A handful
of color
for your PC*

Professional color scanning. Hand-held, compact design. Color Lab image processing/compression software (\$595.00 value). Backed by Mouse Systems' reputation for quality and support.

Get smart, go color. Mouse Systems' PageBrush/Color.



47505 Seabridge Drive
Fremont, CA 94538
(415) 656-1117

Mouse Systems logo is a registered trademark. Other brand and product names are used for identification purposes only and may be trademarks or registered trademarks of their respective holders.

CIRCLE 120 ON READER SERVICE CARD

that matches your board. For Super VGA and higher resolutions, however, it can be a problem. In general, the lower the vertical frequency, the more likely it is that you'll perceive an annoying flicker.



picture on a monitor as constant, rather than being rewritten a number of times each second.

For VGA, vertical frequency isn't a real concern. But for Super VGA, in general, the lower the vertical frequency, the more likely you'll perceive an annoying flicker.

Flicker perception is a function of individual physiology. It depends on a phenomenon called persistence of vision—essentially a measure of how long it takes an image to start fading from the human eye and brain. Persistence of vision lets us look through a series of still pictures on a movie or TV screen and see continuous movement rather than a bunch of disjointed photographs. Combined with a high vertical frequency, it also lets us see the

Given a low enough vertical frequency—and there are a number of boards that qualify—virtually everyone will perceive a flicker and judge it unacceptable, at least under certain lighting conditions with a specific monitor. Similarly, given a high enough vertical frequency, almost everyone will agree that a specified board produces no flicker at all, regardless of lighting conditions or monitor. But at intermediate frequencies, issues of moni-

tor and lighting conditions often do come into play, along with individual perception.

The biggest variable for a monitor is the phosphor on the CRT. The phosphor is what glows to form the on-screen image. Phosphors can be short-persistence (meaning they glow for only a short time), long-persistence (they glow for a long time), or anywhere in between. One of the best examples of a long-persistence phosphor is the green phosphor in the original IBM PC's monochrome display. Scrolling through text on that display leaves a ghostly image where the text used to be. However annoying that ghosting may be, note that monitors with long-persistence phosphors are less likely to show flicker than monitors with short-persistence phosphors, regardless of the vertical frequency.

Perception of flicker also depends on lighting conditions, fluorescent lights being notorious for increasing the likelihood of flicker. And just to make matters more problematic for Windows users: The eye is most sensitive to flicker with the solid-white screen that happens to be the default Windows background.

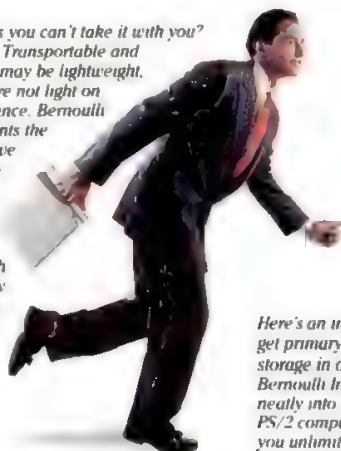
It's useful to know the two extremes for



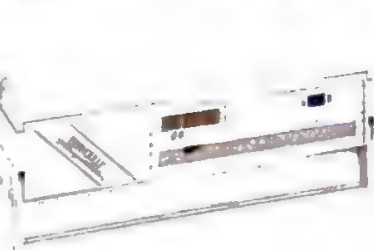
The computing world is a changing place. That's why our new family of universal removable storage products can be easily attached to today's newest systems. Our Parallel Port Interface even connects Bermoulli* to computers without an expansion slot or SCSI port

THE NEW B ANY SYSTEM. ANY

Who says you can't take it with you? The new Transportable and Portable may be lightweight, but they're not light on performance. Bermoulli implements the latest drive enhancements to help you keep pace with your busy schedule

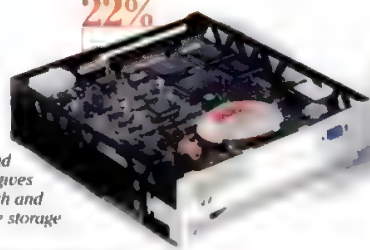


Bermoulli brought worry-free storage to everyone—now you can take it everywhere. Our new Transportable packs all the power and data security of our 44MB removable disk drive into a convenient, AC-powered unit.



PRICES
REDUCED
UP TO
22%

Here's an inside scoop get primary and backup storage in one. The Bermoulli Insider fits neatly into leading PC and PS/2 computers. Plus, it gives you unlimited data growth and the security of removable storage



perceiving flicker. Based on our tests at PC Labs, virtually everyone will see flicker at a 53-Hz vertical frequency. Few people register flicker at the 56-Hz level that is widely used for today's Super VGA resolutions, and fewer still have to blink at the 60-Hz frequency that many manufacturers provide.

At the high end, 70 to 72 Hz is often cited as the magic figure for solving the flicker problem for virtually everyone. But as VESA chairman Jim Anderson points out, this may not be fast enough for monitors larger than 14 inches diagonally. Bigger monitors—up to 20 inches—may need a 74-Hz refresh rate to eliminate flicker. Anderson says that VESA's monitor timing committee is actively looking into this issue, with the goal of establishing a definitive standard.

Given the number of diverse elements involved and the variation in persistence of vision among individuals, the only real answer is to test-drive a monitor/board combination, preferably with the same lighting conditions you'll be working under. Then you can decide for yourself on a case-by-case basis. You're the only one who knows whether the flicker is annoying. Of



course, if you see minimal flicker, you'll have to balance the level of annoyance against the price of a more costly system with a faster refresh rate.

INTERLACING: VARIATION ON A FLICKERING THEME

A different kind of flicker problem can show up for video boards that use a technique called *interlacing*. An interlaced board takes two passes to draw each

paint the whole screen in a single pass, one line at a time, from top to bottom.

Interlacing lets the boards work at high resolutions with relatively inexpensive monitors that have comparatively low vertical frequencies. But interlacing is notorious for "jiggling" any thin horizontal lines—precisely the sort of lines that Windows uses in its icons.

Certainly the best-known interlaced board is IBM's 8514/A, though some proprietary 1,024-by-768 schemes also use interlacing, as IBM's XGA does in its cur-

If you see minimal flicker, you'll have to decide whether it's annoying and whether that annoyance warrants the cost of a noninterlaced monitor.

screen. On the first pass, it draws every other line; on the second, it fills in the gaps. By contrast, *noninterlacing* systems

rent implementation. Note that interlacing is not a requirement for either 8514 compatibility or XGA compatibility. In fact,

ERNOULLI. TIME. ANY PLACE.

You don't have to pamper a Bernoulli. Its patented design flies a flexible disk precisely under the read/write head. Should your system encounter a bump, air impurity, or power loss, the disk simply falls away. The result? Hard-disk performance without the risks



With all the computing choices out there, why limit your options? Our new universality is a unique innovation that lets you easily attach the same Bernoulli to most any system, giving your data (and budget) protection for tomorrow

Bernoulli's removable disks are the most rugged available. And we back that up with an unheard-of 5-year Gold Standard Limited Warranty.

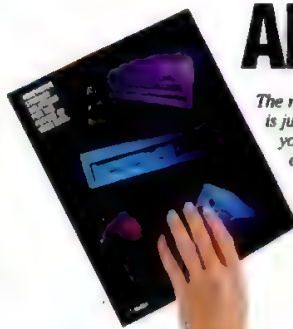


BERNOULLI AT A GLANCE

- Disk Configuration - 5.25" half-height 40MB
- Drive Configurations - single or dual (internal or external) - battery-powered portable
- Effective Access Time - 22 msec
- Disk Shock - 1,000 Gs
- Mean Time Between Failure - 60,000 hrs.
- Compatibility - DOS, PC-AT, PS/2, Macintosh, OS/2, Windows, NetWare, UNIX
- Installed Base - 635,000 drives - \$3,750,000 drives
- InfoWorld Product of the Year 1989



For the truly power hungry, the Bernoulli Dual gives you up to 89MB of removable on-line storage with a 22msec effective access time and unlimited off-line capacity. It makes disk-to-disk copies in under three minutes. That's performance for the real world—at a price that's been reduced up to 22 percent



ANY QUESTIONS?

The rest of the Bernoulli story—including our new, lower prices—is just a phone call away. Dial 1-800-777-3488 for the location of your nearest dealer and we'll rush you a free copy of this limited-edition, 18-page brochure. It's packed with everything you need to know about removable data storage. Any way you like it.

OMEGA
The Makers of Bernoulli

CIRCLE 378 ON READER SERVICE CARD

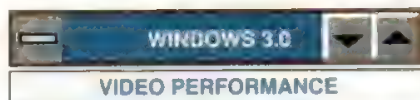
most 8514-compatible boards have a jumper or DIP switch setting to let you change between interlaced and noninterlaced operation. Odds are that XGA-compatible boards, when they appear, will offer the same choice.

IBM has been widely criticized for implementing interlaced video for the 8514 and XGA, and with good reason: Noninterlaced video is obviously the preferred choice for visual comfort. But monitors that can handle a noninterlaced 1,024-by-768 resolution are expensive; the NEC MultiSync 4D, discounted, sells for nearly \$1,000—without the video board!

Like flicker in general, the perception of jiggle in interlaced mode varies with lighting conditions, the persistence of monitor phosphor, and individual physiology. Here again, you're the only one who can decide whether the flicker is annoying and whether that annoyance warrants the cost of a noninterlaced monitor.

BUYING FOR THE FUTURE

We thought it would be interesting to ask Microsoft for the five best ways to improve *Windows*' video performance. The answer was illuminating.



Three of Microsoft's suggestions were fairly obvious tips such as: If you have the option of running the video card in 16-bit mode, make sure you're in 16-bit mode. Similarly, if your system allows shadowing, you should probably use it, but be sure to read the section about EMMExclude in *Windows*' SYSINI2.TXT file. And if you run DOS applications, be sure to read the

256-color driver if you don't need so many colors. But be aware that VGA has a speed advantage over EGA. When you use a *Windows* pull-down menu with VGA, *Windows* will save a bitmap of the screen, and then will put it back in place when you close the menu. *Windows* can't do this with EGA.

If you want to get the most mileage from your board, the last tip may be the most significant of all. Get a board with a

If you've got the money and want to be prepared for the future, get a board with a graphics coprocessor, even if you don't need more than VGA right now.

appropriate section in the manual. The two remaining tips were more interesting.

Make sure you are running the lowest level of video that meets your needs. As we stated before, you shouldn't install a

graphics coprocessor, even if you don't need more than VGA right now. As Microsoft said, if you've got the money and you want to be prepared for the future, a graphics coprocessor is a good idea. ■

ABC Flowcharter for Windows

"Simply the easiest way to document procedures."



ABC Flowcharter™ makes drawing and editing flowcharts easier than ever. It's loaded with features that help you make and edit charts in a fraction of the time needed with other flowcharting or drawing programs.

ABC Flowcharter's advanced link feature lets you break complicated procedures into smaller, more manageable steps. Just click on a shape to display a sub-chart or procedure. It's that easy.

Ask your dealer for a demonstration or call **1-800-227-0847** for more information. See for yourself why **ABC Flowcharter** is quickly becoming the standard flowcharting tool for the Fortune 1000. Retail price \$295.

Roykore™

2215 Filbert St.
San Francisco, CA 94123
415-563-9175

COMPLETE 386-SX

\$1499⁹⁸

ALL OF THE FEATURES YOU WANT

- 16 MHz Q-Tech 386-SX CPU with a Norton SI rating of 18.7. Runs at 3.2 MIPS
- 100% IBM compatible
- Super VGA 14" color monitor featuring sharp 800x600 resolution, plus 16-bit Super VGA video card
- 2 MB of RAM (expandable up to 8 MB on the system board)
- 44 MB, 28ms IDE hard drive
- High-density 3½" and 5¼" floppy drives
- One serial port, one parallel port
- Two 8-bit and six 16-bit expansion slots
- Socket for 80387-SX math co-processor
- 101-key enhanced keyboard
- 200-watt power supply
- One year FREE on-site service
- MS-DOS 4.01
- To get this complete Q-Tech system from Quill, call us and order item #170-DL-SX-1



PLUS, QUILL'S "WE CARE" SERVICE

90-DAY NO-RISK GUARANTEE

We stand behind your satisfaction for three full months...you won't find a better guarantee anywhere else!

FREE TECHNICAL SUPPORT

Quill's Computer Products Specialists can offer knowledgeable, friendly telephone support for as long as you own your system. All you have to do is call.

EASY PAYMENT OPTIONS

You can charge your purchase today on Visa or MasterCard. Qualified businesses can also choose our convenient monthly payment plan or be billed on open account.



LARGE-VOLUME QUOTES

Buying several systems? We will give you a quote that beats our already-low price!

SPEEDY DELIVERY

We're committed to shipping your order within 24 hours after credit approval.

ONE-STOP SHOPPING

From XT's to the new 486, we have over 200 systems that can be configured to meet your needs. Plus, we carry a full selection of peripherals, as well as the supplies you need every day...at bargain prices.



are manufactured by

**SPECIAL OFFER TO FIRST 500 CUSTOMERS:
GET WINDOWS 3.0 AND A MOUSE FOR JUST \$99!**

CALL US TODAY

1-708-634-6650

QUILL

P.O. Box 4700, Lincolnshire, IL 60119-4700

© Copyright 1991, Quill Corporation

Systems that revolutionized the computer industry!

All backed by Northgate® support and service that's unmatched by any other company!

There are a lot of copy-cat "slim-line" systems out there, but don't be confused. These are the ORIGINAL SlimLine systems from the pioneer of this trend-setting technology: Northgate.

In just under a year, SlimLine has become our most popular system. And with good reason. Only SlimLine gives you full 286, 386SX™ and 386™ DX power in a package only 4.25" high and 16.5" square.

Now ... five new SlimLine systems! "Northgate for 1991" features a SlimLine family that offers more choice than ever before: SlimLine 286/12, 386SX/16 and 20 MHz plus SlimLine 386/25.

Our new powerhouse 386/33 rounds out our complete range of systems.

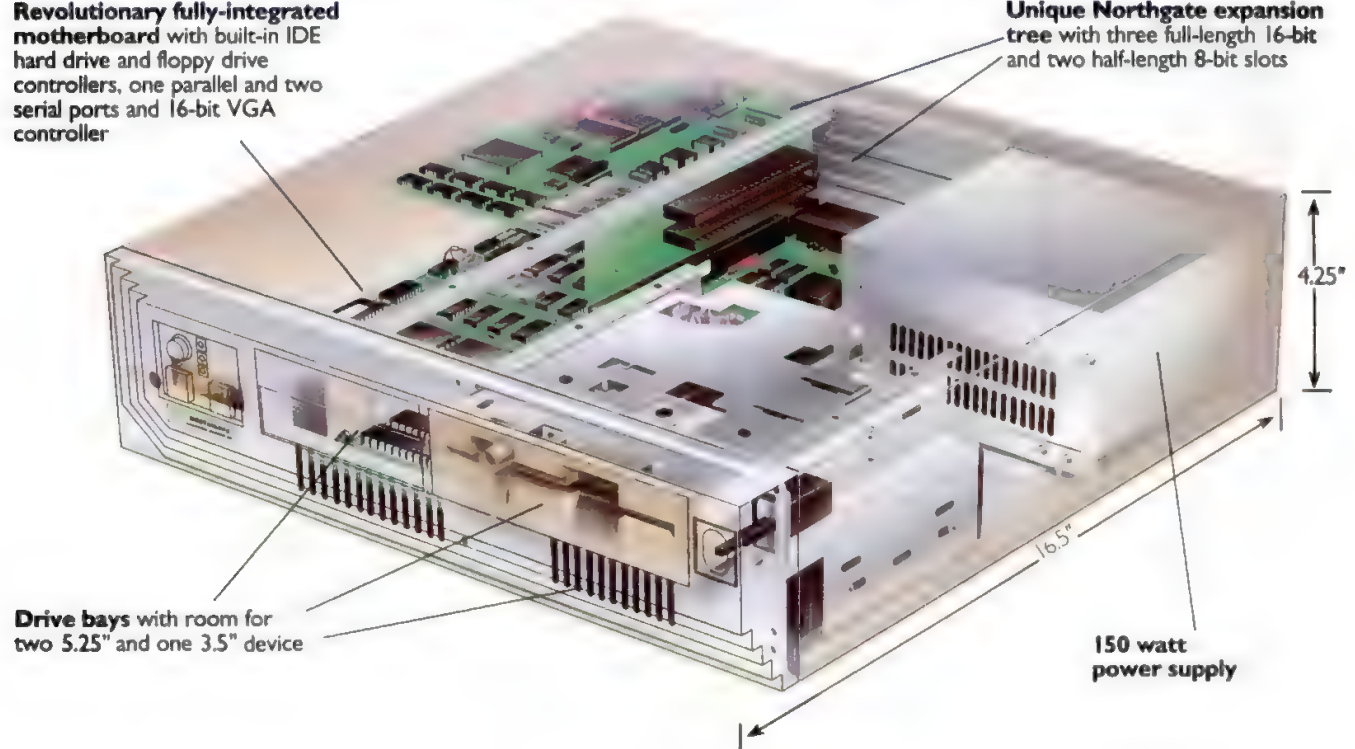
Northgate SlimLine Common Features:

- Small footprint SlimLine case with room for two exposed and one internal half-height devices
- Intel® and Weitek® math coprocessor support
- 150 watt power supply
- Clock/calendar chip rated at five years
- Front mounted reset and high/low speed controls
- MS-DOS 4.01 and GW-BASIC installed
- On-line User's Guide to MS-DOS 4.01
- FCC Class B Certified
- 1 parallel and 2 serial ports
- Built-in VGA video adapter
- Built-in IDE hard drive and floppy disk controllers
- Five open expansion slots (three 16-bit full length, two 8-bit half-length)

Here's how we put full power into a performance package only 4.25" high!

Revolutionary fully-integrated motherboard with built-in IDE hard drive and floppy drive controllers, one parallel and two serial ports and 16-bit VGA controller

Unique Northgate expansion tree with three full-length 16-bit and two half-length 8-bit slots



Here they are...the Northgate family of Super SlimLines™ One format, six sensational systems—take your pick!

NEW! SlimLine 286/12 MHz

Ideal entry level system for use as network terminal or stand alone system for office and home use. Excellent for word processing, simple spreadsheet and light graphics programs.

- Intel® 80286/12 MHz processor
- 1.2Mb and 1.44Mb floppies
- 2Mb of RAM on motherboard
- 12" VGA gray scale monitor
- 40Mb hard drive
- OmniKey® keyboard

\$1699⁰⁰ Or as low as \$55⁰⁰ per month*

NEW! SlimLine 386SX/16 and 20 MHz with 64K cache

No ordinary SX! Northgate engineered these systems with 64K cache memory to allow you to run Microsoft Windows and other 32-bit software at quick cache-enhanced speeds. Handles database management, graphics and spreadsheet applications with ease. Choose 16 or 20 MHz models.

- Intel 80386SX 16 or 20 MHz processor
- 1.2Mb and 1.44Mb floppies
- 2Mb of RAM on motherboard
- 12" VGA gray scale monitor
- 40Mb hard drive
- OmniKey keyboard
- 64K SRAM read/write-back cache
- Microsoft® Windows™ 3.0 and mouse

386SX/16 \$1999⁰⁰ Or as low as \$65⁰⁰ per month*

386SX/20 \$2199⁰⁰ Or as low as \$70⁰⁰ per month*

The system that started it all ... SlimLine 386/20 MHz!

SlimLine 386/20 zips through complex spreadsheets, moderate programming needs, desktop publishing and other demanding applications.

- 12" VGA gray scale monitor
- Intel 80386/20 MHz processor
- Microsoft Windows 3.0 and mouse
- 4Mb of RAM on motherboard
- 40Mb hard drive
- OmniKey keyboard
- 1.2Mb and 1.44Mb floppies

\$2499⁰⁰ Or as low as \$80⁰⁰ per month*

NEW! SlimLine 386/25 and 33 MHz powered up with 64K cache!

Now for the first time ever, you can get award-winning Northgate Elegance™ performance in our SlimLine case! SlimLine 386/25 and 33 are ideal for speeding through processor-intensive tasks like desktop publishing, CAD/CAM, large database and business programming applications.

- Intel 80386/25 or 33 MHz processor
- 1.2Mb and 1.44Mb floppies
- 4Mb of RAM on motherboard
- 12" VGA gray scale monitor
- 64K SRAM read/write-back cache
- Microsoft Windows 3.0 and mouse
- 40Mb hard drive
- OmniKey keyboard

386/25 \$2699⁰⁰ Or as low as \$80⁰⁰ per month*

386/33 \$2899⁰⁰ Or as low as \$90⁰⁰ per month*



Standard SlimLine Upgrades (Add to the base system price)

Hard Drives	12" Gold Star VGA Gray Scale 640 x 480	Gold Star 14" VGA Color 640 x 480	Panasonic 14" VGA Color 1024 x 768	NEC 3D 14" VGA Color 1024 x 768
40Mb IDE	\$ 0.00	\$300.00	\$ 400.00	\$ 650.00
80Mb IDE	\$200.00	\$500.00	\$ 600.00	\$ 850.00
100Mb IDE	\$300.00	\$600.00	\$ 700.00	\$ 950.00
200Mb IDE	\$600.00	\$900.00	\$1000.00	\$1250.00

Call for latest pricing and custom configuration specifications.

"Northgate stops at nothing to please its customers" *PC Magazine* Sept. 25, 1990

- NEW 60-Day No-Risk Trial—if you aren't 100% satisfied, return it!
- Full one year parts and labor warranty on systems, 5 years on OmniKey keyboards.
- Northgate responds to your needs with overnight shipment of parts—at our expense!
- Free on-site service to most locations for one year if we can't solve your needs over the phone.
- Toll-free 24-hour technical support—the industry's best!
- For your convenience, we accept VISA, MasterCard, Discover and Northgate's Big 'N' card. We offer leasing and financing options, too!

CALL TOLL-FREE 24 HOURS EVERY DAY 800-548-1993

New ... fax your order toll free! 800-323-7182

Notice to the Hearing Impaired: Northgate has TDD capability. Dial 800-535-0602.



7075 Flying Cloud Drive, Eden Prairie, MN 55344

"We hear you!"

Northgate® Elegance™...

The industry's highest rated 386™ and 486™ systems!



When we say Northgate manufactures the highest-performing best-supported computer systems in the world ... it's a fact. Industry experts and customers worldwide agree!

In test after test, Northgate Elegance systems perform flawlessly. After the competition has been put through the same demanding paces, only Elegance 386 and 486 emerge as the winners.

And here's the proof! Northgate has won four *PC Magazine* Editor's Choice Awards and received *InfoWorld's* Number One and Number Two Products of 1989. And that's just the beginning.

In the December 1990 Issue of *Computer Shopper*, Elegance 486/25i was awarded the prestigious "Best Buy" honor. That makes an unprecedented FOUR YEARS IN A ROW that Northgate has been voted number one by the publication's readers.

We'd be fooling ourselves (and underestimating you) if we thought you'd buy based on performance alone. That's why Northgate has a corporate commitment to customer service that's equally impressive. No puffery here ...

"...Northgate stops at nothing to please its customers." *PC Magazine* September 25, 1990

- ◆ **NEW 60-Day No-Risk Trial!** To serve you better, Northgate has doubled its No-Risk Trial period to 60 days.
- ◆ **Full one year parts and labor warranty:** 1 year on systems; 5 years on *OmniKey*® keyboards.
- ◆ **Overnight shipment of replacement parts** — at our expense.
- ◆ **Northgate's toll-free 24-hour technical support** leads the industry — most needs are met with just one call!
- ◆ **Free on-site service** to most locations for one year if we can't solve your technical needs over the phone.
- ◆ **Northgate makes state-of-the-art power affordable!** Charge your purchase to your Big 'N' card, VISA, Discover or MasterCard. Ask about financing and leasing options, too!
- ◆ **Call Northgate** before you decide to buy elsewhere. You'll be amazed at our new low pricing!

"What WordPerfect® is to software support, Northgate is to hardware, and there are even a few things WordPerfect could learn from the folks in Minneapolis."

Bernie Zilbergeld
Bay Area Computer Currents
August 14, 1990

Select desktop or optional vertical power case.

Northgate's elegant desktop case features 5-bays with room for 3 exposed and 2 internal half-height devices. Comes with 200 watt power supply. For greater expansion capabilities, choose our vertical 7-bay powerhouse with a 220 watt power supply.

Northgate Page Mode 386/20 MHz

As a cost-efficient, dependable network file server, Page Mode has no equal. Its reliability is confirmed by Novell® certification and by users of office networks every day. Northgate boosts performance of this 386/20 workhorse through the use of an efficient page mode memory management scheme. Other performance features include:

- ◆ Intel® 80386/20 MHz processor
- ◆ 4Mb of RAM (expandable to 16Mb)
- ◆ 40Mb hard drive
- ◆ 1.44Mb and 1.2Mb floppy drives
- ◆ 16-bit VGA video adapter
- ◆ Eight expansion card slots
- ◆ One parallel and two serial ports
- ◆ MS-DOS 4.01 and GW-BASIC installed
- ◆ Microsoft® Windows™ 3.0 and mouse
- ◆ 14" VGA gray scale monitor
- ◆ OmniKey keyboard
- ◆ FCC Class B Certified

\$2699⁰⁰ Or as low as \$80⁰⁰ per month*

Northgate Elegance 386/486 Common Features:

- ◆ American-made motherboard
- ◆ RAM expansion up to 8Mb on motherboard (16Mb total RAM with 32-bit memory card)
- ◆ 16-bit VGA video adapter
- ◆ One parallel and two serial ports
- ◆ MS-DOS 4.01 and GW-BASIC installed
- ◆ Microsoft® Windows™ 3.0 and mouse
- ◆ FCC Class B Certified

Northgate Elegance 386/25 & 33 MHz

The best in their respective classes! Both are ideally suited for managing large databases (over 1000 records), full-time business accounting, multitasking and other demanding applications.

Northgate gives you a powerful standard configuration including high-speed 64K RAM cache and 4Mb of RAM. Take a look at everything you get:

- ◆ Intel® 80386/25 or 33 MHz processor
- ◆ 4Mb of RAM
- ◆ 40Mb hard drive
- ◆ 64K SRAM read/write-back cache
- ◆ 3.5" 1.44Mb and 5.25" 1.2Mb floppy drives
- ◆ 16-bit VGA adapter
- ◆ 14" VGA gray scale monitor
- ◆ OmniKey keyboard
- ◆ Novell Certified

25 MHz **\$2999⁰⁰**
Or as low as \$95⁰⁰ per month*

33 MHz **\$3299⁰⁰**
Or as low as \$105⁰⁰ per month*



Northgate Elegance 486/25 and NEW 486/33 MHz ISA

In addition to receiving an Editors' Choice and 1990 Computer Shopper Best Buy Award, Elegance 486/25i outscores all competitors in InfoWorld Magazine's 1990 reviews of 486 systems. Elegance "leads the pack by a comfortable margin", they said. "It offers impressive performance, exceptional expandability and it is tops in support and value."†

NOW! Northgate introduces the next generation—Elegance 486/33 ISA. Both systems are ideal for heavy-duty business applications like full time database management, CAD/CAM, financial planning, accounting and programming. Includes:

- ◆ Intel 80486/25 or 33 MHz processor
- ◆ 4Mb of RAM
- ◆ 40Mb hard drive
- ◆ 64K SRAM read/write-back cache
- ◆ 3.5" 1.44Mb and 5.25" 1.2Mb floppy drives
- ◆ 16-bit VGA video adapter
- ◆ 14" VGA gray scale monitor
- ◆ OmniKey keyboard

\$5199⁰⁰ 33 MHz **\$5799⁰⁰**
Or as low as \$160⁰⁰ per month* Or as low as \$180⁰⁰ per month*

Standard Upgrades (Add to the base system price)

Hard Drives	14" NEC VGA Gray Scale 800 x 600	Gold Star 14" VGA Color 640 x 480	Panasonic 14" VGA Color 1024 x 768	NEC 3D 14" VGA Color 1024 x 768
40Mb IDE	\$ 0.00	\$300.00	\$ 400.00	\$ 650.00
80Mb IDE	\$200.00	\$500.00	\$ 600.00	\$ 850.00
100Mb IDE	\$300.00	\$600.00	\$ 700.00	\$ 950.00
200Mb IDE	\$600.00	\$900.00	\$1000.00	\$1250.00

Call for the latest pricing and custom configuration specifications.

CALL TOLL-FREE 800-548-1993
24 HOURS EVERY DAY

New... fax your order toll free! 800-323-7182

Notice to the Hearing Impaired: Northgate has TDD capability. Dial 800-535-0602.



**NORTHGATE
COMPUTER
SYSTEMS**

"We hear you!"

7075 Flying Cloud Drive, Eden Prairie, MN 55344

Replace your "mushy" keyboard with the crisp touch Northgate® OmniKey®!

Look...
12 F-keys
on top AND
LEFT!



OmniKey/ULTRA PC Computing Magazine's Most Valuable Product Of 1990!

PC Computing said: "keyboards don't get any better than this."† And it's no wonder! OmniKey/ULTRA gives you twice the features of ordinary keyboards! You get 12 F-keys on left — PLUS 12 switchable Special Function (SF)-keys on top. And, the greatest touch in keyboards.

See for yourself ... use one for 60 days RISK FREE! If you aren't convinced it's the best, return it. We'll refund every penny including ground shipping charges.

Look! More exclusive features!

- ALPS click/tactile mechanical key switches
- Interchangeable CTRL, ALT and CAPS LOCK keys
- Switchable right asterisk and backslash keys
- Exclusive period/comma lock key locks out these <>, locks punctuation in
- Repeat rate select key lets you change from 3-120 CPS from inside DOS or a program
- Unmatched compatibility with IBM®-type systems
- Lifetime quality double-injected keycaps
- FCC Class B certified
- Industry-leading five year warranty

Now! ONLY **\$129⁰⁰**
FOB Minneapolis, MN

OmniKey/102 with F-keys on the left

First keyboard to get back to the basics! 12 F-keys on left for fast one-hand combination commands. Readers of *Computer Shopper* named OmniKey/102 their "Best Buy."



- Northgate's original 102 key design
- 12 function keys on the left
- Interchangeable ALT, CAPS LOCK, and CTRL keys
- Large L-shaped ENTER key
- Calculator-style numeric keypad with added equals key
- Five year warranty
- 60-day no-risk trial
- Separate inverted T cursor control pad
- Unmatched compatibility with IBM-type systems
- ALPS click/tactile mechanical key switches
- FCC Class B certified

OmniKey/102 ONLY **\$89⁰⁰**
FOB Minneapolis, MN

Inventory Reduction...Quantities Limited!



OmniKey/101
with F-keys
on top and
20% smaller
footprint

- Enhanced 101 key layout
- Interchangeable left CTRL, LOCK and CTRL keys
- Calculator-style numeric keypad with added equals key
- Separate inverted T cursor control pad
- ALPS click/tactile mechanical key switches
- Unmatched compatibility with IBM-type systems
- FCC Class B certified
- 10-day no-risk trial
- One year warranty

OmniKey/101-I ONLY **\$69⁰⁰**
FOB Minneapolis, MN

HOURS: Mon. - Fri. 7 a.m. to 12 a.m.; Sat. 8 a.m. to 4 p.m. Central. Dealer and distributor prices available. Se habla español por su conveniencia.

Notice to the Hearing Impaired: Northgate has TDD capability: 800-535-0602

CHARGE IT!
We accept VISA
and MasterCard. FAX
Your Order! 612-943-8332

CALL TODAY!
800-526-2446

**NORTHGATE
COMPUTER
SYSTEMS**
7075 Flying Cloud Drive, Eden Prairie, MN 55344

You can afford award-winning Northgate® performance!



Northgate makes it easy for you to own award-winning 286, 386™ and 486™ computer systems ... just say "charge it" to your Northgate Big 'N' credit card.

It's easy! Simply fill in the Big 'N' information form and send it to Northgate for prompt attention. Once you're approved, call our systems consultants, toll-free, to select the Northgate that's right for you.

Northgate leases systems too! Choose from flexible terms up to five years. It's never been easier to get high-performance Northgate systems than it is right now!

Fill out and return this form today!

Call Northgate Now!
800-548-1993
HOURS: Monday - Friday 7 a.m. - 8 p.m. CST

NORTHGATE COMPUTER SYSTEMS
7075 Flying Cloud Drive, Eden Prairie, MN 55344

OPEN YOUR CREDIT CARD ACCOUNT BY FILLING OUT THE APPLICATION BELOW.

Please complete all appropriate sections, providing at least two years residence and employment history. If you are self-employed, please be sure to complete section d. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This Form Must Be Signed To Process Your Order.) All Financed Purchases Are Subject To Credit Approval. If You Have Any Credit Questions, Please Call For Assistance. Thank You!

A married person may apply for individual credit. I am applying for (check one box, please):

- ☐ JOINT CREDIT with another person. Complete entire application.
☐ INDIVIDUAL CREDIT complete only individual section.
☐ INDIVIDUAL CREDIT but rely on income of another. Complete entire application.

*If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS
You must disclose your marital status:
☐ married
☐ unmarried
☐ legally separated

a. Personal Information

NAME _____ HOME PHONE (____) _____
SOCIAL SECURITY NUMBER _____ DATE OF BIRTH ____/____/____
PRESENT ADDRESS _____ CITY _____ ST _____ ZIP _____
DATE OF RESIDENCE MO. _____ YR. _____ BUY ☐ RENT ☐ OTHER ☐ _____
PREVIOUS ADDRESS _____
EMPLOYER _____ DATE OF EMPLOYMENT MO. _____ YR. _____
MONTHLY GROSS SALARY \$ _____ BUSINESS PHONE (____) _____
PREVIOUS EMPLOYER _____ DATES OF EMPLOYMENT _____ TO _____
Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying the obligation.
ADDITIONAL MONTHLY INCOME \$ _____ SOURCE _____

b. Credit Information

PLEASE TELL US IF YOU HAVE: CHECKING ACCOUNT (Y/N) _____ SAVINGS ACCOUNT (Y/N) _____
BANK LOAN (Y/N) _____ HOW MANY? _____ VISA (Y/N) _____ HOW MANY? _____
MASTERCARD (Y/N) _____ HOW MANY? _____ FINANCE COMPANY LOAN (Y/N) _____ HOW MANY? _____
DEPT. STORE CHARGE CARD (Y/N) _____ HOW MANY? _____ CREDIT UNION ACCOUNT (Y/N) _____ HOW MANY? _____
OTHER MAJOR CHARGE CARDS (Y/N) _____ HOW MANY? _____

c. Joint Applicant's Personal Information

JOINT APPLICANT'S NAME _____ HOME PHONE (____) _____
SOCIAL SECURITY NUMBER _____ DATE OF BIRTH ____/____/____
ADDRESS _____ CITY _____ ST _____ ZIP _____
DATE OF RESIDENCE MO. _____ YR. _____
JOINT APPLICANT'S EMPLOYER _____ DATE OF EMPLOYMENT MO. _____ YR. _____
MONTHLY GROSS SALARY \$ _____ BUSINESS PHONE (____) _____
NAME AND ADDRESS OF NEAREST RELATIVE NOT LIVING WITH YOU _____
RELATIONSHIP _____

d. Self-Employment Information

BUSINESS NAME _____ BUSINESS PHONE (____) _____
TYPE OF BUSINESS ☐ Proprietorship ☐ Partnership ☐ Corporation IN BUSINESS SINCE _____
YOUR ANNUAL INCOME FROM BUSINESS Gross \$ _____ Net \$ _____
PERSONAL BANKER'S NAME _____ BANKER'S PHONE (____) _____

e. Customer Authorization

I authorize Northgate Computer Systems or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct of the best of my knowledge and belief. There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 1-800-548-1993 or write to P.O. Box 59080, Minneapolis, MN 55458-0080.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH—THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDIT-WORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW.

APPLICANT'S SIGNATURE _____ DATE _____

JOINT APPLICANT'S SIGNATURE _____ DATE _____

FOR MARRIED WISCONSIN APPLICANTS:

I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

BUYER'S SIGNATURE _____ DATE _____

*This is a credit application. Upon approval, a credit agreement will be sent to you for your signature. This agreement must be signed and returned to activate your account.

©Copyright Northgate Computer Systems, Inc. 1990. All rights reserved. Northgate, OmniArc and the Northgate Big 'N' logo are registered trademarks of Northgate Computer Systems. We support the ethical use of software. To report software copyright violations, call the Software Publishers Association's Anti-Piracy Hotline at 1-800-388-PIRAT.

V.32 Smorgasbord



UDS offers more choices, more features than any other modem builder

UDS, acknowledged by leading trade magazines and independent research organizations as the world's premier supplier of V.32 modems, offers more variations on the V.32 theme than any other manufacturer.

Every modem in the UDS V.32 family has the dial-up, full-duplex 9600 bps and associated fallback capabilities mandated by the CCITT recommendation. Beyond basic V.32 conformity lies a myriad of features and options. Among the user options available are:

PACKAGING — UDS V.32s may be ordered as board-level IBM plug-ins, in standalone packages or as central site rack-mountable cards.

THROUGHPUT — Selected models offer MNP® levels 4 and 5 for error control and data compression; others, in compliance with CCITT V.42 bis, offer MNP or LAP-M compression throughput rates up to 38,400 bps.

CONNECTIVITY — Sync-Up™ board-level versions of V.32s are available for various combinations of BSC, SNA and OS/2 host-to-remote communication for EDI, X.25, BSC, SNA and LU6.2 applications.

PC APPLICATIONS — V.32s are available in the FastTalk® configuration, designed especially for PC use.

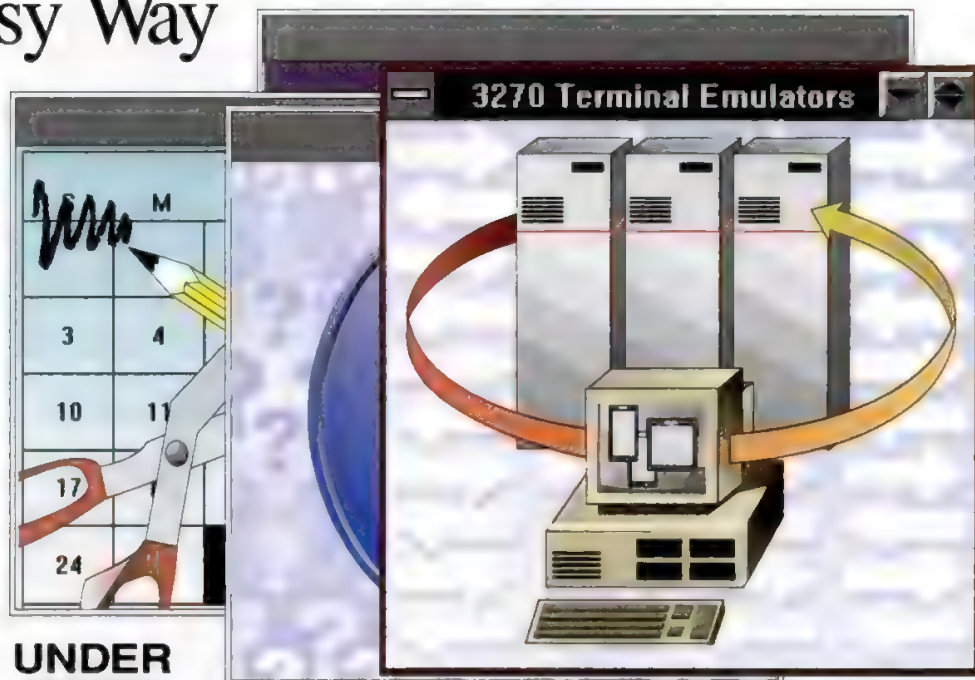
INTERNATIONAL ACCEPTABILITY — Several versions of the UDS V.32 have
CIRCLE 367 ON READER SERVICE CARD

already been qualified to non-U.S. operating standards, assuring their acceptability in multi-national networks.

Features and value make UDS the favorite choice for V.32s. For a look at the whole menu, contact UDS, 5000 Bradford Drive, Huntsville, AL 35805-1993. Telephone 205/430-8000; FAX 205/430-8926.



3270 Emulation The Easy Way



UNDER

Windows 3.0

by Randol Tigrett and Frank J. Derfler, Jr.

The power of *Microsoft Windows* gives the advantage to these five 3270 terminal emulation programs, allowing such welcome benefits as simultaneous viewing of multiple mainframe sessions and data sharing among mainframe and local applications.

The character-based environments of most programs emulating 3270 terminals that link to mainframe computers typically result in screens that can at best be described as functional but sterile.

If you're running only a single session, this poses no particular difficulties. However, once you get into multiple sessions, toggling between mainframe and local applications,

FORTUNATELY, FUTURE SOFT AND NSA AREN'T THE ONLY LEADERS GETTING TOGETHER TO SOLVE COMMUNICATIONS PROBLEMS.



It's amazing what happens when powerful leaders join forces. Network Software Associates (NSA) and Future Soft have formed a strategic alliance to create the ultimate SNA communications solution for Windows 3.

Introducing DynaComm/Elite*. It supports multiple 3270 sessions, power scripting, MDI, flash keypad, IND\$FILE, HP NewWave, APPC and EHLLAPI. It communicates over coax/DFT, SDLC,

AutoSync, async, NetBIOS, IPX/SPX and 802.2. And it supports more than 60 adapters, protecting your investment in IRMA, IBM and many other boards.

Our script language lets you create new Windows interfaces for older 3270 applications. With our exclusive support of MDI, multiple sessions behave like multiple spreadsheets. DynaComm/Elite is the first product to truly integrate 3270 host access into the world of Windows 3.

Only a world-class alliance could result in such a solution. NSA is an IBM Business Partner and the leader in SNA PC connectivity. Future Soft is a veteran Windows developer and the creator of the "Terminal" application included with every copy of Windows 3.

So call today for DynaComm/Elite, bringing together the best of NSA, Future Soft, Microsoft and IBM. If only all world leaders could connect this well.

DynaComm Elite

The SNA Communications Solution for Windows 3.

DynaComm/Elite is a jointly-developed product from Network Software Associates and Future Soft.

CIRCLE 126 ON READER SERVICE CARD

Future Soft Engineering, Inc - 1001 South Dairy Ashford, Suite 101, Houston, Texas 77077. Phone (713) 496-9400.
Network Software Associates, Inc. - 39 Argonaut, Laguna Hills, California 92656. Phone (800) 352-3270.

*DynaComm is a registered trademark of Future Soft Engineering, Inc. Elite is a trademark of Network Software Associates, Inc. DynaComm/Elite is a trademark of both companies. Other trademarks are properties of their respective owners. Photo credit: Reuters/Retnam.

you typically have to page through full-screen displays. A DOS-based emulator can display multiple windows on one screen, but only one of these windows provides a complete view of the session it represents.

PC users, ranging from administrative assistants to system programmers, need to make better use of multiple mainframe sessions. Some users monitor mail systems, such as IBM's popular *PROFS*, constantly in one session, while using a scheduling program in a second session and a major mainframe application in a third. Applications developers often maintain multiple active sessions to receive error messages and to simulate several users.

The solution? A terminal emulator running under *Microsoft Windows*. The five terminal emulators reviewed here can shrink a window displaying a 3270 session to near postage-stamp size if necessary, displaying the full activities of several mainframe programs simultaneously in small screens you can easily read. As a result, you can monitor the activity in as many mainframe sessions as you're likely to have and still use other local applications.

Windows-based emulators have other important advantages. They let you make icons to launch mainframe applications, provide helpful icons to show mainframe activity, and use three of *Windows*' strengths—dynamic data exchange (DDE), dynamic link libraries (DLLs), and the *Windows* Clipboard—to link mainframe and *Windows* applications.

REVIEW CRITERIA

In this review, PC LAN Labs evaluates 3270 terminal emulator software running under *Windows 3.0*. The products we review are *Extra! for Windows* from Attachmate Corp., *IRMA WorkStation for Windows* from Digital Communications Associates, *LinkUp 3270 COAX Windows UniSession* from Chi Corp., *Netlogic W3270 Support Package* from Netlogic, and *Rumba* from Wall Data. They range in price from \$225 to \$495.

Two other companies, Eicon Technology Corp. (514-631-2592) and Tri-Data Systems (408-727-3270), have *Windows* products for certain 3270 connections, but the products in this review are general-purpose emulators. Network Software Associates (714-768-4013) and Future Soft Engineering (713-496-9400) are working together on another 3270 emula-



tor for *Windows*, but it wasn't yet available for review.

THE WINDOWS ADVANTAGE

Users of machines like Sun workstations have known for years that there's nothing wrong with being entertained while you work. The packages reviewed here bear out that idea. Chi Corp., for instance, went all out in designing its product's icons. Using the old West as its motif, the company has cactus trees to hang data on, a boot hill to kick off programs, and other entertaining images. Wall Data Inc.'s *Rumba* uses images evoked by its name with equal effectiveness.

But it is in viewing multiple mainframe sessions that these programs really begin to show their attractiveness. To accomplish their on-screen squeeze play and shrink the session displays, they use sets of fixed-width raster fonts. These fonts, stored in a fixed format, coincide with specific window sizes. As you shrink or expand a window, the program picks a set of fonts in the right size. When your programs have a dozen or more stored fonts, you see a smooth transition between the window sizes.

To share data among applications, *Windows*' dynamic data exchange uses two techniques called *hotspot* and *hotlink*. Hotspot lets you control mainframe applications with your mouse. The terminal emulation program understands cursor movements and other mouse input and translates these signals into ones that the host mainframe application can recognize. For instance, you can double-click your mouse on a screen element generated by the host application or mainframe communications software, and the *Windows* terminal emulation software tells the host to take a corresponding action.

Under the hotlink scheme, products written for *Windows*, such as *Microsoft Excel*, can accept messages in predefined areas of display generated by the host computer. For example, *Excel* can hotlink to a host display session and incorporate information being displayed in predefined segments of the screen.

The 3270 emulation programs running under *Windows* can also benefit from DLLs, which are groups of functions and routines, such as device drivers. *Windows*' DLLs can be shared by all *Windows* applications, which allows more efficient use of memory and disk space.

One good use of *Windows* DLLs is by *IBM Windows Connection*, Version 2.0, which uses the DLL to call IBM's High-Level-Language Application Program Interface (HLLAPI), a programming interface that allows a PC application to communicate with a mainframe one. *Windows Connection* creates a pipe between HLLAPI.DLL and a DOS HLLAPI TSR to transfer requests and data between the *Windows* applications and the DOS sessions.

Another way applications can share data is through the *Microsoft Windows* Clipboard. All the products reviewed here include an edit feature that allows the user to copy portions of the host display to the *Windows* Clipboard and then paste the same data to another application's *Windows* session. Unlike DDE, the Clipboard



EDITORS' CHOICE

● IRMA WorkStation for Windows

IRMA WorkStation for Windows isn't the easiest product to install or the most fun to use. It also ties for the most expensive of the products reviewed here. But Digital Communications Associates' \$495 product is by far the most flexible we tested. DCA supports all the 3270 host connection options, and the *IRMA* software works smoothly, quickly—at least in DFT mode—and reliably.

Wall Data's \$495

Rumba came in a close second, but it lost the bid for Editors' Choice because it lacks support for CUT terminal emulation. We are convinced that some users need CUT mode and could not depend completely on a system offering only DFT.

IRMA led the industry in pioneering the use of PCs as 3270 terminals, and DCA is well known for its technical support. *IRMA WorkStation for Windows* also offers some added benefits not offered by the other products reviewed, such as its asynchronous communication program. It's nice to see *IRMA*, or at least the back of her head, out there again as the leader of the pack.



requires user intervention to move the data between applications.

Other advantages of *Windows*-based terminal emulation programs include the graphical user interface itself. *Windows*' GUI helps reduce the problems typically associated with remapping the PC keyboard to emulate the much larger 3270 keyboard. On-screen keyboard maps make it easy to realign the keyboard and to select special keys with the mouse rather than hitting them.

And, although it isn't a *Windows*-related trait, these products also have the ability to record and execute macros. Attachmate's facility for creating macros is particularly nice because you can insert a pause that allows keyboard input during

the macro's execution. This is useful for entering a date, a password, or some other element of information.

THE MAINFRAME CONNECTION

Network and mainframe managers can use several different connection options to connect mainframe computers and PC LANs, and the *Windows*-based 3270 emulators reviewed can accommodate each. The classic method of attaching a PC to a mainframe, of course, is through a coaxial adapter board in the PC, popularized by DCA's well-known IRMA card. A coaxial adapter marketed by IBM, the 3270 Connection, competes with the

IRMA line as an industry standard.

A PC acting as a terminal over a coaxial link can operate in one of several modes. The CUT (Control Unit Terminal) mode allows single mainframe sessions. In DFT (Distributed Function Terminal) mode, the 3270 terminal can have up to five concurrent sessions with the mainframe. A related mode called MLT (Multiple Logical Terminal) uses IBM's 3174 Terminal Cluster Controller to allow multiple sessions, with hotkey switching between them, on otherwise CUT-mode terminals.

In IBM's Systems Network Architecture (SNA), all elements of the network are categorized as specific types of Logical Units (LUs). Mainframe printers, for

A LOOK AT THE TERMINAL CLUSTER CONTROLLER

by Frank J. Derfler, Jr.,
and Randol Tigrett

The terminal cluster controller is a standalone device—in some cases physically larger than the biggest PC—that links IBM 3270 series terminals to mainframes. But it isn't a PC. Its job? This common yet critical device filters, enhances, and controls the information traveling over the link from a PC to a mainframe computer.

IBM's 3274 and 3174 cluster controllers are the devices usually used in all Big Blue installations. But IBM has some competition from several companies, particularly Memorex Telex. The Memorex Telex team has been in the business of beating IBM at its own terminal and peripheral game for a long time, and the company has some interesting connection alternatives.

A controller like the Memorex Telex 1174 typically costs about the same as the comparable IBM product, the 3174. The price of each starts at more than \$11,000 before adding options and expansion modules (which can double the cost).

The configuration process of the two controllers is also similar in that both devices need the same information. The IBM device is set up according to a printed manual, while Memorex Telex uses an interactive set of questions that appear on the screen of the CUT-mode terminal. Note that configuring either controller requires a terminal operating in CUT mode, so

emulators without CUT-mode capabilities can't do the job.

Both companies' devices come in several models, but the IBM 3174 and Memorex Telex 1174 controllers can connect up to 254 terminals (and PCs acting like terminals) to as many as 10 to 16 logical or 3 to 8 physical hosts. The 1174 series contains several different Intel and Motorola microprocessors that handle communications tasks. IBM uses its own processors.

Because the company positions its product as having more features than the IBM 3174 for a similar price, the Memorex Telex controller has several utilities for terminal or terminal emulation users. These include an on-screen calculator, a call-back feature for async communication, the ability to put multiple sessions in screen windows for the terminals, and a utility to cut and paste between sessions.

CONNECTION SCHEME

In the typical PC- to IBM-mainframe connection scheme, PCs use special internal adapters, like the ubiquitous DCA IRMA card, and 3270 terminal emulation software to connect to a port on the cluster controller. The controller regards the PC as a permanently connected terminal.

The latest trend in PC- to IBM-mainframe links, however, is to create a Token-Ring LAN with the PCs and elements of the mainframe, usually the front-end processor, interacting as

peers on the network. The appealing logic of this architecture is that a network of interconnected peer nodes is the best way to implement shared-resource computing applications. But there are drawbacks as well.

The initial hardware package needed to connect a mainframe element to the Token-Ring LAN, for one, costs in the neighborhood of several thousand dollars. Also, the constant interaction with the separate SNA physical units on the network puts a load on the mainframe's communications processor.

Modern devices such as the Memorex Telex 1174 and the IBM 3174 can simultaneously act as controllers for directly connected PCs, as connection points for LAN gateways, and as mainframe connection points on a Token-Ring network. Either controller can save the more expensive mainframe communications hardware from the task of handling a lot of SNA physical units.

Since the 1174 or 3174 can connect to ASCII devices, you can use them to link 3270 terminals to the RS-232C ports of a 386- or 486-based PC running a multitasking DOS system such as *PC-MOS*, *Quick Connect*, *Concurrent DOS*, *VM/386*, or *386/MultiWare*. In this way, the 3270 terminals can control DOS applications running on the shared PC—an interesting connection scheme that lets you keep down the number of monitors and keyboards on each desktop. ■



MainLan Ethernet tops the leader board at just \$199 per node.

A hole in one: The Starter Packs contain everything you need to link two PCs.

MainLan™

Announcing new MainLan: The drive and power of Ethernet priced way under par.

It's a stroke of genius.

New MainLan™ is a genuine industry-standard Ethernet Net BIOS network. Yet it costs hundreds less than the competition's proprietary network. Just \$199/computer! Now that's a hole in one.

\$199

True Ethernet means you get lightning-fast data transfer speed—10 mbps in fact. That's 5 times faster than the leading proprietary network. You also get increased power for all your networking tasks like

file sharing, e-mail, printer sharing, and using network versions of software—all without needing a server.

And industry-standard MainLan won't limit you like a proprietary network. As your business grows, MainLan Ethernet lets you add more PCs without losing performance.

New MainLan's easy to install and operate. Just plug it in, and follow the simple, on-screen menus.

You'll be ready to go in only 10 minutes.

The MainLan Ethernet Starter Pack is just \$499—way under par for a complete network system. And adding another PC is only \$199. True Ethernet has never been this affordable.

The MainLan Family suits you to a tee.

Ready for a bigger, more powerful network? Meet MainLan 386 Ethernet, the

low-cost, high-performance network that supports hundreds of PCs through a 386 file server computer.* Best of all, MainLan 386

software works with the MainLan Ethernet hardware you already own.

There's even a MainLan Ethernet card for connecting the all-new IBM® PS/1 with any MainLan or Novell Ethernet network.

It's the only complete

ready-to-run Ethernet card that fits inside the PS/1* instead of an expansion box.

Why buy a proprietary network that isn't the industry-standard, can't be expanded, and costs a bundle?

Go with MainLan Ethernet and play the links like a pro—without getting killed on the greens. To order, call 1-800-999-6770.

\$199

There's even MainLan Ethernet PS/1, the only ready-to-run, Novell compatible PS/1 network available.

Suits you to a tee: MainLan Ethernet to start out, and MainLan 386 Ethernet as your network grows.

Fuzzy Zoeller, winner of both the Masters and the U.S. Open.

NICE SHOT MAINLAN—I want to link up today!

NAME _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
VISA _____ MC _____ AMEX _____ CHECK _____
CARD # _____ EXPIR. DATE _____
SIGNATURE _____

US Sage, Inc., 2005 Tree Fork Lane, Suite 113, Longwood, FL 32750
Phone (407) 331-4400, FAX (407) 331-4406
CANADIAN RESIDENTS:
Call GENTEK at (416) 738-9300, FAX (416) 738-5563

MAINLAN ETHERNET STARTER PACK—all the hardware and software I need to link up 2 PCs. \$499.00
MAINLAN ETHERNET PS/1 STARTER PACK—everything I need to link up two PS/1s. \$499.00
MAINLAN EXTENSION PACKS—to add more PCs to any MainLan network. \$199.00 each

Indicate quantity: _____ MainLan Ethernet _____ MainLan Ethernet PS/1

Add \$10.00 shipping and handling to each order. All MainLan products have a 30-day money-back guarantee and 30-day toll-free technical support.

MainLan™
THE WAY A NETWORK SHOULD WORK.

CIRCLE 230 ON READER SERVICE CARD

System Requirements: IBM PC, XT, AT, MCA, or compatible or PS/1.
© 1990 US Sage, Inc. MainLan is a trademark of US Sage, Inc.

MainLan Ethernet requires as little as 15K of RAM for workstations. *MainLan 386 Ethernet available January 1991. All company and product names are trademarks or registered trademarks of their respective owners.

1-800-999-6770



instance, use LU1 and LU3; terminals are LU2. In addition to emulating a terminal in one or more other sessions, it's often useful to configure your PC to emulate a printer in one mainframe session. You can tell a mainframe application to print to a specific printer—actually a PC—and capture the output as a DOS file as it comes across the mainframe-to-micro link.

If you use any sort of a link to an IBM mainframe, these products are a reason to install *Windows*.

Coaxial adapters are tried-and-true technology, and all the companies that sell the software in this review (except for Netlogic) also sell coaxial adapters—but usually with prices up in the \$500 to \$600 range. Typically, the adapters will emulate both the IBM and IRMA products. If you're looking for a bargain, a company called Whitebox (404-446-8673) sells a low-priced generic 3270 adapter that will emulate either an IBM or IRMA adapter and works well with all the 3270 emulation software. Whitebox sells its adapter for \$395 and has even better prices for volume purchases.

The coaxial terminal adapter connects to a device called a terminal cluster controller that links a group of PCs to the mainframe front-end processor. IBM provides most of the terminal cluster controllers in use, but companies like Memorex Telex offer flexible and economical alternatives (see the sidebar "A Look at the Terminal Cluster Controller").

Each PC takes a port on the terminal cluster controller, which connects to the host computer either by Token-Ring or synchronous data link control (SDLC). Coaxial connections, overall, form a popular connection scheme, but they get expensive because of the need for a dedicated port for each PC attached to the cluster controller.

Another connection alternative, a LAN gateway, significantly reduces the cost of connection (see "Building Workgroup



Solutions: LAN Gateways," Parts 1 and 2, *PC Magazine*, November 29, 1988, and December 13, 1988). In this configuration, the workstation PCs run terminal emulation software and communicate to the host through one machine acting as a mainframe gateway on the network.

Networked PCs can also take advantage of the direct Token-Ring connection specified by IEEE standard 802.2. A piece of equipment called the IBM Token-Ring Interface Coupler (TIC) gives certain types of IBM mainframe equipment a direct connection to the Token-Ring network. PCs and mainframes on the network can interact directly as peers, as long as each machine runs the appropriate software.

This type of connection is popular in new installations because it eliminates the need for gateways, dedicated coaxial cable connections, and more terminal cluster controllers.

All of the 3270 terminal emulators in this review, as mentioned, can operate in the coaxial-, gateway-, and TIC-connected terminal environments. It's easier by far to install a terminal emulator via a direct coaxial connection, so this option will be around for a long time.

BIG INVESTMENTS

Corporations and institutions across the globe have multi-billion-dollar investments in IBM computers using the 3270 communications architecture—and in the programs run on this hardware. In addition to the ubiquitous 3270 terminals, tens of thousands of PCs are equipped with software and hardware products allowing them to emulate these terminals. PCs, in

other words, aren't going to push these systems out the back door anytime soon. And interaction between PCs and mainframes is vital to many organizations.

If you use any sort of a link to an IBM mainframe computer, the products included here represent one of the best reasons yet to install *Microsoft Windows*. You'll also find they are the kind of programs that make a difference in how people use computers.

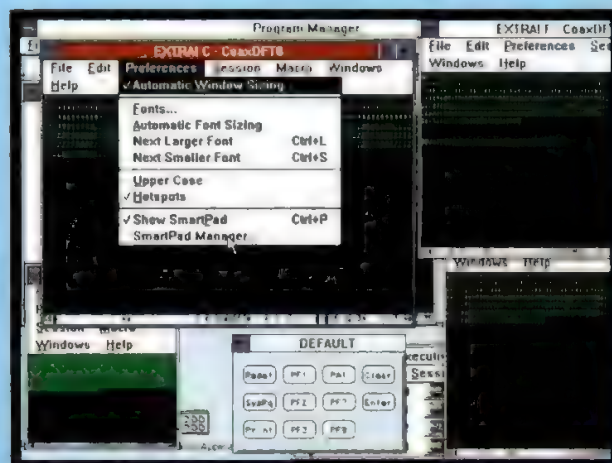
Extra! for Windows

All reviews by Randol Tigrett

Attachmate has its finger on the pulse of 3270 users. Its *Extra! for Windows* program makes it easy to manipulate and control parameters; it also provides a smart set of default selections tailored to please users. *Extra!* makes the grade for LU2 terminal support, but this version of the software lacks LU1 and LU3 printer support and a hotlink option. Attachmate plans to release a new version in December 1990 that will include the printer support and more screen fonts; it should be available by the time you read this. The \$425 *Extra!* software with its \$50 3270 gateway option was the easiest product to configure, and our testing proved it to be dependable for the most part, except for one test it couldn't complete.

EMULATION OPTIONS

A well-known player in the 3270 terminal market, Attachmate won Editors' Choice in previous reviews of 3270 emulation products for DOS and Token-Ring (see "Building Workgroup Solutions: LAN



This screen from Attachmate's *Extra! for Windows* shows four windows, each displaying a separate 3270 session. Note how you can read the text in all but the smallest screen. The pull-down menu shows options for selecting larger and smaller font sizes (and therefore window sizes).

FACT FILE



Extra! for Windows, Version 3.0
 Attachmate Corp.,
 13231 SE 36th St.,
 Bellevue, WA 98006;
 800-426-6283, 206-644-4010.
List Price: \$425;
 3270 gateway option,
 \$50; 3270 Coax Adapter (for XT or AT), \$570;
 Advanced 3270 Adapter/2 (for PS/2), \$595.
Requires: 44K RAM; Windows, Version 2.0 or later.
In Short: This company listens to its users, and the resulting product is rich in features, offering windowed keypad mapping and extra security functions. It lacks a hotlink option and ran into some trouble during DFT testing, but a promised new release should add such capabilities as 3270 printer emulation and more fonts.

CIRCLE 418 ON READER SERVICE CARD

WINDOWS 3.0

3270 TERMINAL EMULATORS

3270 terminal keys. The window allows you to use a mouse to select 3270 terminal keys like Reset, System Required, and PA1 without struggling with alternative key combinations on a PC's 83- or 101-key keyboard.

On the downside, Attachmate's terminal emulation program supports only seven fonts. Although the system allows you to expand and shrink the session windows nicely, the small variety of font sizes keeps the windows' resizing from working as smoothly as with some other packages.

Nevertheless, the program's dynamic font selection doesn't display any confusing, extraneous black space around the terminal emulation session, like the *LinkUp* package does. And the December 1990 release of *Extra!* will include support for 13 fonts.

Also on the downside, the one feature missing in Attachmate's program, present in competing packages, is a hotlink option. This makes it more difficult to link host programs to a *Microsoft Windows* application.

CUT-MODE PERFORMER

Despite the lack of a hotlink option, Attachmate's emulator generally performed well in our tests of CUT-mode terminals. However, in the sliding alpha pattern test, which evaluates LU2 single-session terminal emulation, it did not display the last character in the lower-right-hand corner of the screen. This was a repeatable occurrence. If you were using a word processing program, you would have to page in another portion of memory (probably by

scrolling down) to see the extra character. It also ran into an unresolved problem during the DFT terminal tests and terminated abnormally without completing them.

If you run into a problem, you can reach Attachmate's large 60-person technical support team from 6:30 A.M. to 5 P.M. Pacific time at a toll-free number. Attachmate also offers a bulletin-board service that supplies software updates and information.

Extra! for Windows is a friendly and useful program. The version we saw doesn't provide the full richness of its namesake in the DOS world, but Attachmate's plans for the product will make it a tough contender in future releases.

IRMA WorkStation for Windows

Digital Communications Associates' *IRMA WorkStation for Windows* supports more IBM Systems Network Architecture (SNA) features than any other terminal emulation program in this review. IRMA is the only product we reviewed that provides LU1 and LU3 printer emulation and LU2 terminal emulation with both CUT and DFT support. It also includes an asynchronous terminal emulator program with diagnostic abilities (*Rumba* is the only other program that can make asynchronous connections). Because of DCA's long experience in the 3270 terminal emulation business, its products are widely supported.

The *IRMA WorkStation* software costs \$495, while the adapters range from the

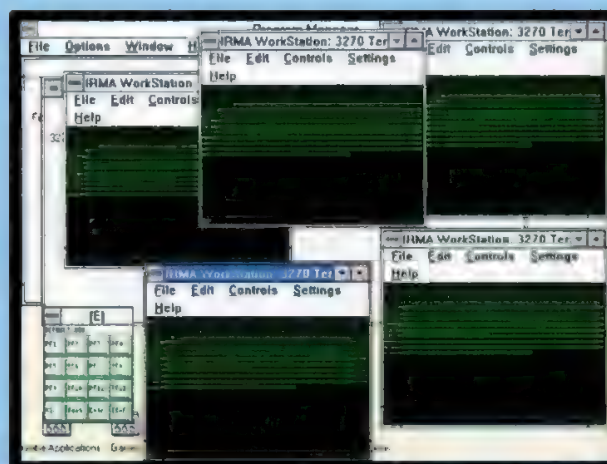
Gateways, Part 2," *PC Magazine*, December 13, 1988; and "Building Workgroup Solutions: Direct Token-Ring to Mainframe Connections," January 30, 1990). Its *Extra!* program runs on IBM and Attachmate adapters, as well as adapters that emulate IBM. Attachmate also markets a three-in-one card that emulates an IBM, IRMA, and Attachmate 3270 adapter. The Advanced 3270 Adapter for XT or AT computers sells for \$570, and the Advanced 3270 Adapter/2 for PS/2 machines is \$595. The software will gain the ability to run over IRMA adapters in the December 1990 release.

Attachmate's software is very easy to install and configure. We chose *Extra!*'s default options from the installation menu and had the whole system operational in about 10 minutes. To save the configuration of the emulator, Attachmate provides a unique function called "lock configuration" that locks it with a password. You can even use a password to protect certain options and keep users from changing the SNA parameters.

SMART SELECTIONS

Attachmate provides a snappy and well-designed set of default selections, including a windowed keypad, hotspots, and a few different font sizes.

The SmartPad manager lets you easily change the keyboard mapping by choosing different keystroke combinations to match the special keys on a 3270 keyboard. Or you can use a related SmartPad utility to create a small window containing graphics buttons representing specific



You can do useful work in at least three of the five windows shown in this screen from DCA's *IRMA WorkStation for Windows*; in the others, you can see what is happening. A wide variety of fonts makes it easy to size the screens, and the keypad makes using the special 3270 keyboard functions a snap.

Greetings from the

1990 World Class Award for
Best Mail-Order Company



□ 3 1/2" format available from us. Specify when ordering.

□ package includes both 5 1/4" and 3 1/2" disks.

■ 3 1/2" format available from manufacturer by request. Call us for details.

CP—copy-protected; NCP—not copy-protected.

The four-digit number next to each product is the product's ITEM NUMBER. Please refer to this number when ordering. Thank you.

SOFTWARE

We only carry the latest versions of products. Version numbers in our ads are current at press time.

Products listed here in red are Microsoft Windows Applications.

Adobe Systems ... NCP

- 7547 □ Adobe Type Manager for Windows \$59.
 - 8367 □ ATM & Plus Pack Bundle 169.
 - 7392 □ Adobe PostScript Cartridge 289.
- (Entire Adobe Type Library, from 1 to 133 is available. Call for more information.)

Aldus ... NCP

- 1332 □ PageMaker 3.01 499.

Alpha Software ... NCP

- 5104 □ Alpha Four 1.1 319.

Application Techniques ... NCP

- 1214 □ Pizazz Plus 2.0 69.



Chipsoft ... NCP
6221 □ TurboTax 8.0 & Quicken Bundle—A complete financial solution. With these two industry leading programs, you can quickly and easily transfer information for planning and preparing your taxes \$79.

- 4450 **Ashton-Tate ... NCP**
□ dBASE IV 1.1 \$499.
- 7384 **Asymetrix ... NCP**
□ Toolbook 1.0 for Windows 309.
- Avery ... NCP**
6006 □ Label Pro 1.0 (Laser) 49.
- 7336 □ Label Pro 1.0 for Dot Matrix 49.
- Bitstream ... NCP**
7568 □ FaceLift 1.0 for Windows 2.x/3.0 59.
- 8040 □ FaceLift for WordPerfect 5.0/5.1 59.
- Typeface Packages each 89.
- Bloc Publishing ... NCP**
1447 □ FormTool Gold 3.0 55.
- 6245 □ Pop Drop Plus 1.0 59.
- Borland International ... NCP**
7357 □ Turbo C++ 1.0 Professional 209.
- 7356 □ Turbo Pascal Professional 2nd Ed. 179.
- 6242 □ Quattro Pro 2.0 339.
- 1514 □ Paradox 3.5 529.
- Broderbund ... NCP**
1434 □ New Print Shop 39.
- ButtonWare ... NCP**
6419 □ PC-File 5.0 89.



Adobe Systems ... NCP
7547 □ Adobe Type Manager for Windows—Automatically cleans up the jagged or stick figure type displayed on your screen, as well as text printed from dot matrix printers. Includes 13 scalable fonts \$59.

- Caere ... NCP**
6004 □ OmniPage 386 2.1 599.
- Central Point ... NCP**
5039 □ PC Tools Deluxe 6.0 95.
- 8114 □ Backup 6.0 65.
- Chipsoft ... NCP**
1663 □ TurboTax 8.0 for 1990 Taxes 45.
- State Packages each 34.
- 6221 □ TurboTax 8.0 & Quicken Bundle 65.
- CompuServe**
7546 DOS Membership Kit 23.
- Concentric Data Systems ... NCP**
6575 □ R & R Relational Report Writer 4.0 159.
- Corel Systems ... NCP**
5506 □ CorelDRAW! 2.0 389.
- Data Storm ... NCP**
4798 □ PROCOMM PLUS 1.1 65.
- DCA ... NCP**
7936 □ Crosstalk Communicator 1.0 59.
- 2908 □ Crosstalk XVI 3.71 119.
- 5611 □ Crosstalk for Windows 1.1 129.



Delrina Technology ... NCP
4325 □ PerFORM 2.1—Get the same award winning form generating software for GEM at a fantastically different, and low, price. Limited time offer \$95.

- Delrina Technology ... NCP**
4325 □ PerFORM 2.1 for GEM 95.
- 7351 □ PerFORMPRO 1.0 for Windows 299.
- Fifth Generation Systems ... NCP**
7725 □ Direct Access 5.0 65.
- 7795 □ Disklock 1.0 109.
- 3950 □ Fastback Plus 2.1 119.
- FormWorx ... NCP**
5810 □ FormWorx with Fill & File 2.5 85.
- 7311 □ Form Publisher for Windows 1.2. 139.
- Fox Software ... NCP**
6188 □ FoxPro 1.02 459.
- Franklin Software ... NCP**
7071 □ Language Master 3.0 49.
- 7416 □ Language Master 3.0 for Windows 59.
- Funk Software ... NCP**
7380 □ P.D. Queue 1.0 (print spooler) 52.
- 2228 □ Sideways 3.3 59.
- Great American Software ... NCP**
4880 □ One Write Plus Acct. Sys. 2.06 189.
- 5825 □ Money Matters 2.0 42.



Corel Systems ... NCP
5506 □ CorelDRAW! 2.0—The PC graphics software that's fast, fun and powerful. CorelDRAW! 2.0 now comes with more drawing power, more type control, and more value...and it's still easy to use . . . \$389.

Icebox of Cheshire Co.



Reality Technologies ... NCP
 7891 ☐ **WealthStarter 1.0**—Tired of living paycheck to paycheck? Use WealthStarter to create a budgeting, savings and investing system that really makes the most of the money you make. \$49.

- Hayes ... NCP**
 7983 ☐ Smartcom Exec 2.0 79.
HDC Computer Corp. ... NCP
 7389 ☐ Windows Express 3.0 52.
 7383 ☐ First Apps 1.0 52.
Hilgraeve ... NCP
 2323 ☐ HyperACCESS/5 2.0 (DOS & OS/2) 115.
IBM ... NCP
 6599 ☐ Current 1.1 239.
Individual Software ... NCP
 6222 ☐ Resume Maker 1.3 29.
Inset Systems ... NCP
 7298 ☐ Hijaak 2.0 99.
 7300 ☐ Inset Plus Hijaak 125.
Insight Development ... NCP
 8320 ☐ PrintTools 1.0 85.
 8687 ☐ Print-a-Plot 2.0 189.
Intuit ... NCP
 2426 ☐ Quicken 4.0 39.
Isogon ... NCP
 7478 ☐ FontSpace 2.0 59.



Qualitas ... NCP
 386MAX & BlueMAX let you run your 386 & Windows to the MAX! New! BlueMAX is the ultimate memory manager for 386 PS/2s!
 7539 ☐ 386MAX 5.1 \$75.
 7967 BlueMAX 5.1 (3 1/2" only) 85.

- Laser Go ... NCP**
 7635 ☐ Go Script Plus 3.0 \$189.
LaserTools ... NCP
 6882 ☐ PrintCache 2.3 99.
Lord Publishing ... NCP
 5191 ☐ Ronstadt's Financials 1.02 75.
Lotus ... NCP
 5417 ☐ 1-2-3 3.1 429.
 5653 ☐ 1-2-3 2.2 349.
 5134 ☐ Magellan 2.0 109.
MECA ... NCP
 4603 ☐ Andrew Tobias' Tax Cut-1990 Taxes 49.
 2798 ☐ Managing Your Money 7.0 135.
Microcom ... NCP
 7649 ☐ Virex 1.1 79.
 6234 ☐ CarbonCopy Plus 5.2 119.
Micro Logic ... NCP
 6787 ☐ Info Select 1.1 55.

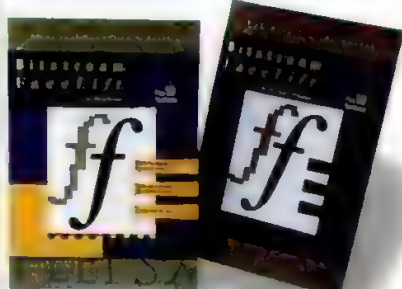


Inset Systems ... NCP
 7298 ☐ **Hijaak 2.0**—Capture screens and convert graphics files with Hijaak release 2.0. New features include 5K pop-up, many new raster and vector formats and support for 16 fax devices \$99.

- Microsoft ... NCP**
 7010 ☐ Windows 3.0 99.
 7388 ☐ Project for Windows 1.0 459.
 7387 ☐ PowerPoint for Windows 1.0 329.
 2904 ☐ Works 2.0 99.
 2901 ☐ Word 5.0 209.
 6195 ☐ Word for Windows 1.1 329.
 2856 ☐ Excel 2.1 329.
 2853 ☐ C Compiler 6.0 329.
 8137 ☐ Office for Windows (includes Excel, Word for Windows, and PowerPoint) 659.
Multisoft ... NCP
 4925 ☐ PC-Kwik Power Pak 1.5 79.
Nolo Press ... NCP
 2982 ☐ WillMaker 4.0 39.
PC Globe ... NCP
 5902 ☐ PC Globe 4.0 39.
 5900 ☐ PC USA 2.0 39.

1-800/243-8088

MMC PC Connection 810M
 6 Mill Street
 Marlow, NH 03456
 SALES 603/446-7721 FAX 603/446-7791



Bitstream ... NCP
 Fast and easy-to-use, FaceLift scales printer fonts to any size. Includes 13 typefaces to give you professional documents instantly.
 7568 ☐ FaceLift 1.0 for Windows 2.x/3.0 \$59.
 8040 ☐ FaceLift 1.0 for WordPerfect 5.0/5.1 59.

- Personics ... NCP**
 4384 ☐ Ultravision 2.0 79.
 7048 ☐ Monarch 1.0 (Data Mgmt. Tool) 319.
PowerUp ... NCP
 7860 ☐ Calendar Creator Plus 3.0 45.
 7858 ☐ Express Publisher 2.0 89.
Precision Software ... NCP
 6600 ☐ Superbase 4 for Windows 1.2 429.
Qualitas ... NCP
 7539 ☐ 386MAX 5.1 75.
 7967 BlueMAX 5.1 (3 1/2" only) 85.
Quarterdeck ... NCP
 6422 ☐ QRAM 1.0 49.
 3221 ☐ Expanded Memory Mgr. 386 5.1 59.
 3220 ☐ DESQView 2.3 75.
 4586 ☐ DESQView 386 2.3 125.
Reality Technologies ... NCP
 7891 ☐ WealthStarter 1.0 49.
 6572 ☐ WealthBuilder 1.1 145.
Reference Software ... NCP
 4396 ☐ Grammatik IV 1.0 52.
 7483 ☐ Grammatik for Windows 1.0 52.
Revolution Software ... NCP
 4480 ☐ VGA Dimmer 2.01 (screen saver) 29.
RightSoft ... NCP
 4155 ☐ RightWriter 4.0 54.
Roy Kore ... NCP
 8162 ☐ ABC Flowchart 1.1 189.
Samna ... NCP
 5799 ☐ Ami Pro 1.2 309.
Sitka/TOPS ... NCP
 6675 ☐ TOPS Network Bundle 3.0 159.
 3720 Flashcard 2.1 (AppleTalk ntwrk. card) 155.
Softlogic Solutions ... NCP
 3542 ☐ Software Carousel 4.01 55.
Software Publishing ... NCP
 3499 ☐ PFS:First Publisher 3.0 99.
 3478 ☐ PFS:First Choice 3.1 105.
 3496 ☐ Professional Write 2.2 169.
 3482 ☐ Harvard Graphics 2.3 329.
Solution Systems ... NCP
 7977 ☐ Brief 3.0 (Programmer's Editor) 189.
Spinnaker ... NCP
 7604 ☐ PLUS for Windows 1.0 289.

PC CONNECTION®

The colder it gets



Solution Systems ... NCP

7977 ☐ **Bref 3.0**—The programmer's editor. Gives you unmatched editing power and flexibility. Completely reconfigurable keyboard, multi-level Undo, C-like macro language, source level debugger and more \$189.

Symantec ... NCP

- 3152 ☐ The Norton Commander 3.0 ... 105.
- 6397 ☐ The Norton Backup 1.1 ... 105.
- 3146 ☐ The Norton Utilities 5.0 ... 119.
- 3425 ☐ Q&A 3.0 ... 229.
- 7999 ☐ Norton Anti-Virus 1.0 ... 89.

Systems Compatibility ... NCP

- 8215 ☐ OutsideIn 1.0 ... 65.
- 6564 ☐ Software Bridge 4.1 ... 79.

TIMESLIPS ... NCP

- 2987 ☐ Timeslips III 4.0 ... 195.
- 6994 ☐ PercentEdge 1.0 ... 69.

Timeworks ... NCP

- 6253 ☐ Publish-It! 1.1 ... 115.

Touchstone Software ... NCP

- 8516 ☐ PC Test 1.01 (with free VHS tape) ... 45.
- 7420 ☐ Check It 3.0 ... 89.

Traveling Software ... NCP

- 5179 ☐ LapLink III 3.0 ... 95.

Ventura Software (Xerox) ... NCP

- 7796 ☐ Ventura Publisher for Windows 3.0 ... 569.



TIMESLIPS ... NCP

2987 ☐ **Timeslips III 4.0**—Perfect for service professionals (ie. accountants, lawyers, etc.) who need to track & bill their time ... \$195.
6994 ☐ **PercentEdge 1.0**—Calculates mortgages, loans, annuities, present values, & more 69.

West Lake Data Corp. ... NCP

- 7577 ☐ PC-FullBak+ 1.12 ... \$52.
- 7574 ☐ PathMinder+ 1.0 ... 79.

Wolfram Research ... NCP

- 8281 ☐ Mathematica 386 ... 599.

WordPerfect Corp. ... NCP

- 7781 ☐ LetterPerfect 1.0 ... 129.
- 3804 ☐ WordPerfect 5.1 ... 265.
- 6685 ☐ DrawPerfect 1.1 ... 279.

WordStar International ... NCP

- 6791 ☐ WordStar Prof. 6.0 ... 279.

XTREE ... NCP

- 6161 ☐ XTreePro Gold 1.4 ... 85.

RECREATIONAL/EDUCATIONAL

Broderbund ... CP

- 8068 ☐ Where in the World is Carmen Sandiego Deluxe Edition ... 52.
- 5851 ☐ SimCity ... 33.



Quarterdeck ... NCP

4586 ☐ **DESQView 386 2.3**—Put DESQView and Expanded Memory Manager 386 together and you've got DESQView 386. It can now work in conjunction with Windows 3.0 ... \$125.

Electronic Arts ... NCP

- 6436 ☐ Hunt for Red October ... 20.
- 7865 ☐ PGA Golf ... 39.

Harvard Associates ... NCP

- 2324 ☐ PC Logo 3.0 ... 59.

Microsoft ... NCP

- 7881 ☐ Entertainment Pk for Windows 1.0 ... 29.
- 8270 ☐ Aircraft and Scenery Designer 1.0 (req. FS 4.0) ... 29.
- 2858 ☐ Flight Simulator 4.0 ... 39.

Microsoft Press (Books)

- 8126 Running with DOS 4th Edition ... 20.
- 8129 Running Windows (2nd Edition) ... 22.
- 8136 Running Microsoft Excel ... 22.

Penton Overseas ... NCP

- ☐ VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese) ... each 39.

Sierra On-Line ... CP

- 5106 ☐ Space Quest III ... 39.
- 7972 ☐ King's Quest V ... 45.

Spectrum Holobyte ... NCP

- 5993 ☐ Welltris ... 22.
- 7602 ☐ Faces ... 27.



Samna ... NCP

5799 ☐ **Ami Pro 1.2**—Windows-based word processor for high-powered office automation tasks. Includes mail merge, macros, thesaurus, style sheets, and integrated drawing and charting capabilities ... \$309.

Software Toolworks ... NCP

- 4659 ☐ Chessmaster 2100 (CP) ... 35.
- 7372 ☐ World Atlas ... 42.

Stone & Assoc. ... NCP

- 5231 ☐ Phonics Plus ... 22.
- 3433 ☐ Algebra Plus Vol 1 (ages 13+) ... 27.

Toyogo ... NCP

- 7676 ☐ Nemesis Go Master Deluxe ... 88.

True BASIC, Inc. ... NCP

- ☐ Kemeny/Kurtz Math Series ... each 45.

HARDWARE

Manufacturer's standard limited warranty period for items shown is listed after each company name. Some products in their line may have different warranty periods.

American Power ... 2 years

- 7108 Smart UPS 400 ... 339.
- 6811 360SX (stand-by power source) ... 219.
- 7106 520ES (stand-by power source) ... 329.

AST Research ... 5 years

- 1299 SixPakPlus 384k C/S/P ... 179.
- 8041 SixPak 286 0k ... 99.

Boca Research ... 5 years

- 7001 BOCARAM/AT PLUS (0-8 Meg) (LIM 4.0 extended) ... 125.

- 7061 BOCARAM/XT OK (0-2 Meg, LIM 4.0) ... 99.

- 6998 I/O Board for AT ... 59.

- 8380 BasicVGA (256K 640 x 480) ... 79.

- 8381 SuperVGA (1 Meg 1024 x 768) ... 145.

Bravo Communications ... 2 years

- 7400 2 Pos. Laser Compatible Switch Box ... 109.

Brown-Wagh ... 1 year

- 8578 Creative Labs Sound Blaster ... 179.

Canon ... 1 year

- 7894 BJ-10e BubbleJet Printer (4.6 lb.) ... 349.

- 7897 BubbleJet Ink Cartridge ... 23.

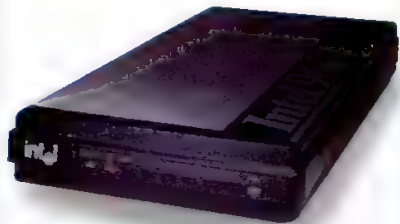
- 7896 Sheet feeder for BJ-10e ... 75.

CH Products ... 1 year

- 8119 FlightStick w/Falcon & GameCard III ... 79.

- 7345 Rollermouse (Trackball) serial ... 85. bus ... 99.

the faster we ship.



Intel ... 5 years

7880 9600EX Modem—Provides ultra-fast data communications without sacrificing compatibility. Supports V.32 & V.42bis 9600 bps operation, as well as MNP Level/5 and Hayes compatible 2400/1200/300 bps modes . \$549.

- Curtis ... lifetime**
 1704 Universal Printer Stand PS-1 18.
 1708 Ruby-Plus SPF-2 Plus 65.
 7358 Command Center 89.
 Glass Filter Plus (specify size) . . ea. 65.

- Datadesk ... 3 years**
 6901 Switchboard 175.

- Epson ... 2 years**
 We are an authorized Epson Service Center.
 1906 FX-850 (80 col., 264 cps, 9 pin) . . . call
 1904 FX-1050 (136 col., 264 cps, 9 pin) . . . call
 5183 LQ-510 (80 col., 180 cps, 24 pin) . . 289.
 1930 LQ-850 (80 col., 264 cps, 24 pin) . . call
 1917 LQ-1050 (136 col., 264 cps, 24 pin) call
 5184 LX-810 (80 col., 180 cps, 9 pin) . . . 185.
 7775 Equity LT-286e Laptop (1 yr wrnty) . 1995.
 7774 Equity LT-386SX Laptop (1 yr wrnty) 3069.

- Hayes ... 2 years**
 2307 Smartmodem 2400 349.
 8049 JTFax 9600B 499.
 7391 Ultra 9600 Modem 799.

- Hewlett-Packard ... 1 year**
 6754 LaserJet III (w/toner) 1699.
 6582 LaserJet IIP (w/toner) 1069.

- Intel ... 5 years**
 6421 2400B MNP Internal Modem 199.
 4696 2400B Internal Modem 159.
 2352 2400B Internal Modem 2 (for PS/2) 249.
 5119 2400 Baud External Modem 179.
 6420 2400EX MNP Modem 229.
 7880 9600EX Modem 549.
 2346 Inboard 386/PC w/1 Meg 495.
 5336 Above Board Plus 8 2 Meg 599.
 5342 Above Board Plus 8 I/O 2 Meg . . . 629.
 7782 SatisFAXtion (fax board) 399.

- MATH COPROCESSORS**
 7385 80287XL (16 MHz 80286 CPU's) . . 199.
 4750 80387SX (16 MHz 80386SX CPU's) 309.
 2371 80387 (16 MHz 80386 CPU's) . . . 349.
 2372 80387-20 (20 MHz 80386 CPU's) . . 399.
 4121 80387-25 (25 MHz 80386 CPU's) . . 499.

- Kensington Microware ... 1 year**
 2582 Master Piece Plus 109.
 7899 Expert Mouse serial . . 119. bus . 129.

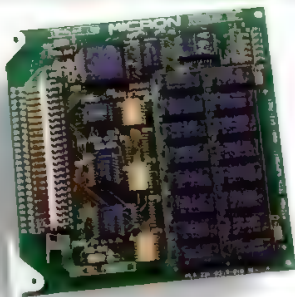
- Key tronic ... 3 years**
 4518 101 Plus Keyboard \$99.

- Kraft ... 5 years**
 5800 3 button Thunder Joystick 29.
 5813 Game Card/Thunderstick Bundle . . 55.
 7862 TopTrack (Laptop Trackball) 79.

- Logitech ... limited lifetime**
 7768 C9 Mouse with Windows 149.
 6029 Trackman (Trackball) serial 85. bus 89.
 4297 ScanMan Plus (hand scanner) . . . 179.
 7975 ScanMan 256 319.
 8694 MouseMan 69.

- Micron Technology ... 2 years**
 7595 2 Meg Expansion for HP LaserJet IIP or III 119.
 7012 Beyond Memory Board for PS/2 Model 70 (2 Meg) 149.

- Microsoft ... lifetime**
 7597 Microsoft Mouse 89.
 2897 Mouse with Paintbrush 105.
 2898 Mouse with Windows 3.0 149.



Micron Technology ... 2 years

7595 HP LaserJet IIP/III 2 Meg Memory Upgrade—A simple and inexpensive way for you to get the most of your laser printer. A must for desktop publishing or for printing full-page graphics \$119.

- MicroSpeed ... 1 year**
 PC-TRAC Trackball
 6007 serial 75. 6008 bus 89.
 7271 Inport 79. 6330 PS/2 79.

- Mouse Systems ... lifetime**
 5997 Trackball (1 yr. wrnty) serial 65. bus 69.
 7878 PC Mouse III 89.

- NEC ... 2 years**
 4799 Multisync 2A (VGA Monitor) 499.
 5085 Multisync 3D Monitor 689.

- Orchid Technologies ... 4 years**
 7512 ProDesigner VGA II (1024 x 768) . . 299.

- PC Power & Cooling ... 1 year**
REPLACEMENT POWER SUPPLIES
 3203 Turbo Cool 200 159.

1-800/243-8088

MMC **PC Connection** **810M**
 6 Mill Street
 Marlow, NH 03456
SALES 603/446-7721 FAX 603/446-7791



Intel ... 5 years

7782 SatisFAXtion—Send and receive faxes from within most applications using the print command. Built-in 2400 bps MNP modem standard. Includes coupons for free PC Tools and Fax-It software \$399.

- 7915 Turbo Cool 300 165.
 3200 Silencer 150 (84% noise reduction) 115.
 7053 InnerSource 2210 399.

- Pacific Data Products ... 1 year**
 6779 25 Cartridges in One! (for LJ II, IIP III) 275.
 Memory upgrade for LaserJet IIP/III

- 7054 1 Meg . . . 149. 7055 2 Meg . . . 199.
 7758 3 Meg . . . 269. 7759 4 Meg . . . 329.
 7158 Pacific Page 4.0 (for LaserJet IIP/III) 379.

- 6834 Pacific Page with free 2 Meg Memory Board (for LaserJet II) . . . 379.

- Practical Peripherals ... 5 years**
 3103 2400 Baud Internal Modem 129.
 3102 2400 Baud External Modem 179.
 5286 2400 Baud Int. MNP Modem (Lex. 5) 169.
 5285 2400 Baud Ext. MNP Modem (Lex. 5) 209.
 4542 2400 Baud Internal Modem for PS/2 . 229.
 8132 PM2400 Pocket Modem 109.
 7934 PM9600SA Modem 489.

- PSION .. 1 year**
 7086 MC600 Mobile Computer 2149.



Canon ... 1 year

7894 BJ-10e BubbleJet Printer—Light weight, excellent print quality and a great price make this 4.6 lb. printer a winner. Choice of black or white. Optional sheet feeder \$349.

PC CONNECTION®

Call 1-800/243-8088.

Reflection Technology ... 1 year	
7127 Private Eye (virtual display)	\$499.
SAFE Power Systems ... 2 years	
7913 Safe 650W	459.
Targus ... lifetime	
6037 Premier Leather Carrying Case.	199.
TheComplete PC ... 2 years	
8082 TheComplete Half Page Scanner/400 w/ReadRight Personal OCR Software 289.	
6797 TheComplete Fax Portable	319.
5828 TheComplete Communicator	449.
Tripp Lite ... 2 years	
6199 Isobar 4-6 (4 outlets, 6 ft. cord)	49.
6200 Isobar 6-6 (6 outlets, 6 ft. cord)	59.
6624 BC450 (450W Battery Backup)	269.
Video 7 ... 7 years	
5883 1024i VGA (includes 512k)	199.
4931 VRAM VGA 512k	369.



Logitech ... limited lifetime

New! ScanMan 256 offers 256 real shades of gray. MouseMan has the ultimate shape for comfort and fit.

7975 ScanMan 256	\$319.
8694 MouseMan	69.

DRIVES

IOmega ... 1 year	
5116 Bernoulli II 44 Meg Internal	995.
7551 Bernoulli II Transportable 44 Meg	997.
5113 44 Meg Cartridge Tripak (5 1/4")	249.
2500 PC2B Controller	229.
Mountain Computer ... 2 years	
2917 40-80 Meg Internal Tape Drive	259.
5500 80-152M Int. Tape Drive	629.
5190 DC2000 Pre-formatted Cartridges ea.	35.
6153 DC2120 Tape Cartridge (5 pack)	149.
Pacific Rm ... 1 year	
5010 1.2 Meg External (for PS/2's)	215.
6602 1.44 Meg External (for PC/XT/AT)	239.
Plus Development ... 2 years	
6424 Hardcard II 80 Meg (19 ms)	599.
8304 Hardcard II XL 50 Meg (9 ms)	399.
8287 Hardcard II XL 105 Meg (9 ms)	689.
Seagate ... 1 year	
2285 20 Meg Int. Hard Drive ST225 (w/controller and cables, 65 ms)	255.
2286 30 Meg Int. Hard Drive ST238R (w/controller and cables, 65 ms)	269.
4554 40 Meg Int. HD ST251-1 (28 ms)	329.

TEAC ... 1 year	
4670 1.44 Meg Drive for PC/XT (3 1/2")	\$89.
4326 1.44 Meg Drive for AT	109.

DISKS

Maxell ... lifetime	
2789 5 1/4" MD2-D 360k Disks (Qty. 10)	12.
2792 3 1/2" DS/DD 720k Diskettes (Qty. 10)	14.
2793 3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	27.



Hayes ... 2 years

8049 JTFax 9600B—Good, solid fax board from the company who wrote the book on communications. TSR fax software, print capture and one-step convert and send are just a few of the features \$499.



Insight Development ... NCP

8320 PrinTools 1.0—Utilities for the HP LaserJet, DeskJet & compatibles. Includes Spooler, Screen Dump, Screen Capture, SetUp, Plot with HPGL/2 support, and Help utilities \$85.

Sony ... lifetime	
3291 5 1/4" DS/DD 360k Disks (Qty. 10)	10.
3297 3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
3298 3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	22.
8185 QD 2040 Tape Cartridge	19.

MEMORY

6556 256k DRAMs (100 ns, set of 9)	call
5510 1 Meg x 9 SIMMs (80 nanosecond)	call
5746 1 Meg Chips (80 ns, set of 9)	call

OUR POLICY

- We accept VISA and MASTERCARD only.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. \$250 minimum.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- COD max. \$1000. Cash, cashier's check, or money order.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice.
- To order, call us Monday through Friday 8:00 AM to 1:00 AM, or Saturday 9:00 AM to 5:30 PM. You can call our business offices at 603/446-3383 Monday through Friday 9:00 AM to 5:30 PM.



Practical Peripherals ... 5 years

7934 PM9600SA Modem—Practical Peripherals does it again by making communications affordable with their newest modem featuring the data compression & error correction of 9600bps V.32 & V.42bis operation . . . \$489.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

- Call 603/446-7721 for information.

PC CONNECTION®

© COPYRIGHT PC CONNECTION, INC., 1993. PC CONNECTION, PCTV AND THE PACOON CHARACTER(S) ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC., MARLOW, NH. ALL OTHER TRADEMARKS REMAIN THE PROPERTY OF THEIR RESPECTIVE COMPANIES.



PC Chronicles.

Call me a lyre.

(Or, how we wrote the book on PC mail order.)

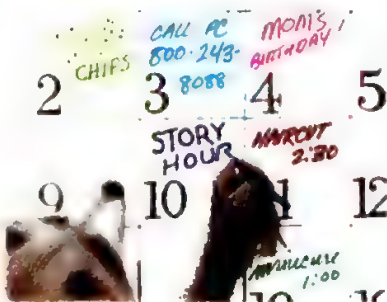
Truth tends to be stranger than fiction in the telltail town of Marlow, NH (pop. 564). That's why you'll often find the local color gathered 'round the ancient sage as he recounts in vivid detail how our forest glade was transformed into a PC paradise.

For, in days of yore, buying software and peripherals by mail was a perilous task, fraught with danger and uncertainty. Only those well versed in the black arts dared risk such unpredictable delivery and uncertain compatibility.

Then one day the enlightened Order of the Connection appeared majestically on the scene, bringing

the classic virtues of toll-free tech support, prompt shipping, and way-under-retail prices to the brave new world of the IBM PC. Since that glorious day our humble home has served as a beacon of light to noble users in cottages, condos, and corporations throughout America. **That'll be the day.**

It's not every day of the week you get offered your very own 1991 PC Connection Calendar. This very timely offer includes 13 classic illustrations of our legendary mascots, all your favorite holidays, and fascinating historical facts about the fiefdom of Marlow, NH. This wondrous wall calendar is free to everyone who places an order of \$750 or more between now and February 28.



Mark time with the PC Connection Calendar featuring our very own day-tripping mascots. Offer not available to accounts on net terms. One per customer.

PC CONNECTION

©COPYRIGHT PC CONNECTION, INC., 1991. PC CONNECTION AND THE FACEDON CHARACTERS ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC., MARLOW, NH.

DCA IRMAIII Convertible for the ISA or MCA bus at \$695 to the DCA IRMAII for ISA or MCA at \$1,195. Synchronous and Token-Ring adapters are also available.

All of the 3270 terminal emulation products are easy to install under *Windows 3.0*. The *IRMA WorkStation* was generally as easy as any of the others, but because of all its options and capabilities, the configuration process can be complex and time-consuming for some connection schemes. DCA supplies all the manuals necessary to make you the SNA guru in your organization, along with printed forms you can use to survey your installation. You then consult the answers you gather from users to finish configuring the program for your network.

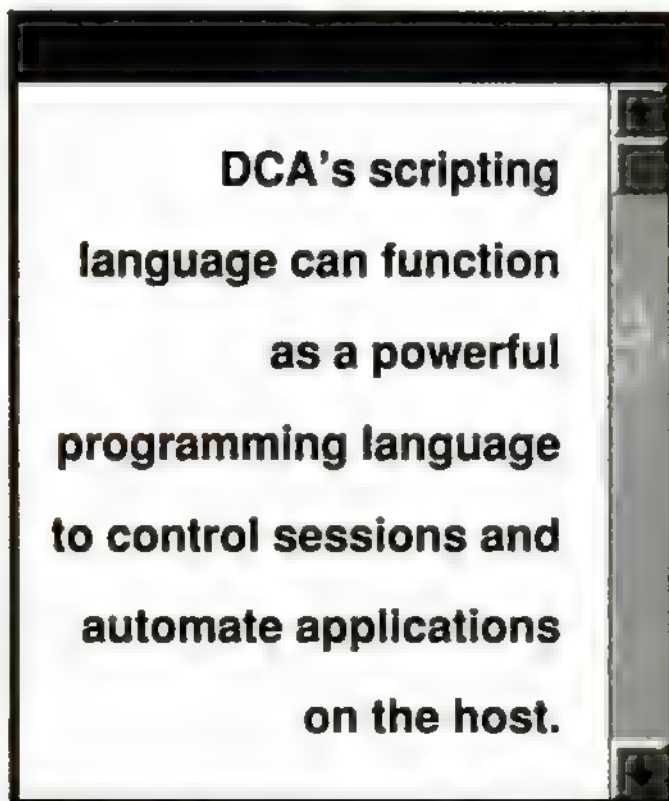
MAKING ACCESS EASIER

IRMA WorkStation for Windows includes such features as a scripting language, keyboard mapping, macro support, and a small-window keypad that emulates 3270 keys on-screen. Activating a 3270 terminal session under *Windows* is simple, and you can save your profile for future sessions. The only problem is selecting the session definitions for multiple terminal sessions. If you choose a previously selected session name, the program generates an error. This can be confusing; somewhere on the menu DCA should flag the sessions in use, or it could remove the



session name from the menu after you pick it.

A keystroke-recording function built into the emulator lets you automate your log-on sequence to the host or the way you call up programs. The recording function



monitors the keystrokes you use to communicate with the host and creates a simple script file you can replay to log in or access host programs. In addition, DCA's scripting language can work as a powerful programming language to control sessions and automate applications on the host. Setting up a library of special script functions improves productivity and reduces the time you spend on the host. If you have to pay for access time for the host connection, then the time you invest in learning the scripting language is well worth it.

ASYNCHRONOUS FEATURES

In addition to these synchronous terminal emulator features, *IRMA WorkStation* comes with an asynchronous terminal emulator running under *Windows*. This scaled-down version of DCA's *CrossTalk for Windows* gives you just what you need for communicating with other PCs or ASCII hosts like VAX machines.

The diagnostic suite for the asynchronous terminal emulator includes log and trace capabilities for your *Windows* sessions. The log program saves certain messages to files, usually high-level diagnostic messages received from mainframe applications as they start and stop operation. The trace program captures SNA-level messages. You get a lot of information from both the log and the trace programs. DCA supplies software filters to

make it easy to find errors in the large diagnostic files generated by these programs.

In our performance test, IRMA fell to the bottom of the performance list for CUT-mode terminals. However, the product ranked slightly better in the five-session DFT test.

DCA offers a wide range of maintenance and support programs. One program, known as the DCA Support Plan, is intended primarily for large corporate clients, but any DCA customer can subscribe. The package offers services and options ranging from 800-number access to guaranteed 4-hour response to your location.

Though it may not be a winner in terms of speed, DCA's *IRMA WorkStation for Windows* provides features and SNA support that Big Blue's customers will appreciate. This is a top-notch product.

LinkUp 3270 COAX Windows UniSession

The peril of the graphical interface is the icon that leads nowhere; unfortunately, Chi Corp.'s *LinkUp 3270 COAX Windows UniSession* displays a few of these. *LinkUp* is Chi's basic entry-level 3270 terminal emulation software running under *Microsoft Windows*. Though it offers some clever features, high throughput, Clipboard support, and a very reasonable price tag of \$225 for the system software (plus \$470 for a coaxial adapter), the program has an unfinished look.

Chi isn't a new player. The company has a long history of providing communications and terminal emulation products, primarily for Unisys mainframe computers. Its nine-track tape unit won Editors' Choice nearly two years ago (see "To Mainframe and Back: Data Transfer by Nine-Track Tape," *PC Magazine*, April 25, 1989).

CONFIGURABLE INSTALLATION

The *LinkUp* installation program copies the files to a specific directory and creates a configuration file. Since the install program generates an ASCII file, you can easily modify it to include different parameters, such as changing the emulation to LU2 modes 2 through 5. This is the only program reviewed here that doesn't allow



**IRMA WorkStation
for Windows,
Version 1.0**
Digital
Communications
Associates Inc.,
1000 Alderman Dr.,
Alpharetta, GA
30202-4199; 800-
241-4762, 404-442-4000.

List Price: \$495; DCA IRMAIII Convertible (ISA or MCA bus) coaxial connection adapter, \$695; DCA IRMAII (ISA or MCA) coaxial connection adapter, \$1,195; DCA Synchronous Adapter, \$395; IRMATRAC Token-Ring adapter, \$895.

Requires: 500K RAM; *Windows*, Version 3.0.
In Short: The variety of SNA functions available in DCA's *IRMA WorkStation for Windows* puts it ahead of its competitors. Its support, flexibility, powerful scripting language, interface, and asynchronous abilities make it a top choice. The package includes an informative diagnostic communications program, and it's the only one to offer an asynchronous terminal emulator.

CIRCLE 419 ON READER SERVICE CARD

Rob Peter to Pay Paul



NORTON USERS: Upgrade to
MACE UTILITIES Version 1990
for just \$50!

"Mace Utilities, Version 1990: Emergency Room Pushes Aside Norton's Disk Doctor"

"...it can get you out of hot water while other programs are vainly attempting to save the day"

- Edward Mendelsohn,
PC MAGAZINE Associate Editor

Now that the jury is in, a lot of people who bought Peter Norton's Norton Utilities Advanced Edition wish they had bought Paul Mace's Mace Utilities Version 1990 instead.

It's easy to understand. In announcing its prestigious Editor's Choice Award, PC Magazine noted that The Mace Utilities Version 1990 "repairs damage that nothing else has the nerve to even look at."

Well, here's good news. If you bought Norton Utilities, just "rob" the title page from the User Manual, and we'll upgrade you to Mace Utilities Version 1990 for just \$50. That's \$100 off the retail price, right now!

Not only is The Mace Utilities Version 1990 the acknowledged leader in recovering lost or damaged hard disk data, it also includes many extra features like virus protection and "smart" recovery of dBase and word processor files - performing fully automatic (and reversible) diagnosis and repair with no user assistance.

Why go without the *ultimate* hard disk utilities any longer? Just send us the title page from your Norton Utilities manual (any version) and your check for \$50. We'll rush your copy of Mace Utilities Version 1990 back to you.



Owners of any other disk utilities program can take advantage of the same offer. Credit card owners can upgrade by calling 1-800-873-4384.

CIRCLE 286 ON READER SERVICE CARD

FIFTH GENERATION SYSTEMS *The Creators of FastBack*

10049 N. Reiger Road Baton Rouge, LA 70809 (504) 291-7221 1-800-873-4384

3270 TERMINAL EMULATORS



Products listed in ascending price order

LU2, or Logical Unit 2 in IBM's SNA, includes modes 2 through 5, which are either physical terminals or display modes for PCs emulating terminals. All the products reviewed support LU2 modes 2 through 5 and make use of Microsoft *Windows*, dynamic link libraries (DLLs).

The mainframe connection options describe different ways in which the PC acting as a terminal—or a network that includes PCs emulating terminals—can communicate with a mainframe. Coaxial connections are not listed because all the

IND\$FILE is a mainframe editing utility used for PC-to-mainframe file transfers.

In addition to a general product manual, certain vendors provide **SNA documentation** in order to supply information that the user may need to interface the terminal emulator with a mainframe using SNA.

	LinkUp 3270 COAX Windows UniSession	Netlogic W3270 Support Package	Extra! for Windows	 IRMA WorkStation for Windows	Rumba
List price	\$225	\$249	\$425	\$495	\$495
SUPPORTED 3278 79 TERMINAL MODELS					
Control Unit Terminal (CUT)	■	■	■	■	□
Distributed Function Terminal (DFT)	□	□	■	■	■
Multiple Logical Terminal (MLT)	■	■	■	■	□
LU1 printer	□	□	□	■	■
LU3 printer	□	□	□	■	■
WINDOWS 3.0 SUPPORT					
Multiple Document Interface (MDI)	□	□	□	■	□
Supports dynamic data exchange (DDE)	□	■	■	■	■
Uses dynamic link libraries (DLL)	■	■	■	■	■
Includes script language	■	■	□	■	■
Can use <i>Windows</i> scalable fonts	■	■	□	□	■
Number of fixed-width raster fonts	12	13	13	10	9
Hotspot	□	■	■	■	■
Hotlink	□	■	□	□	■
On-screen keyboard maps	■	□	■	■	■
Trace support	■	□	■	■	■
MAINFRAME CONNECTION OPTIONS					
802.2 (TIC)	■	□	■	■	■
SDLC	■	□	■	■	■
NetBIOS	■	□	■	□	■
NetWare IPX/SPX	□	■	□	□	□
Asynchronous connections	□	□	□	■	■
OTHER SUPPORT					
LU 6.2	□	□	□	■	■
IND\$FILE	■	■	■	■	■
Maximum block size	32K	2K	32K	32K	32K
HLLAPI	■	□	■	■	■
DOCUMENTATION AND TECHNICAL SUPPORT					
SNA documentation	■	□	■	■	□
BBS	□	□	■	■	■
Free technical support	■	■	■	■	■ (90 days)
Toll-free technical support number	■	□	■	■	■

 Editors' Choice ☒ **Yes** ☐ **No**

Everything You Ever Wanted In UNIX. And Less. \$99.95*



OK. We know it's hard to believe. So just consider this. Coherent™ is a virtual clone of UNIX. But it was developed independently by Mark Williams Company. Which means we don't pay hundreds of dollars per copy in licensing fees.

What's more, Coherent embodies the original tenet of UNIX: small is beautiful. This simple fact leads to a whole host of both cost and performance advantages for Coherent. So read on, because there's a lot more to Coherent than its price.

SMALLER, FASTER...BETTER.

Everybody appreciates a good deal. But what is it that makes small so great?

For one thing, Coherent gives you UNIX capabilities on a machine you can actually afford. Requiring only 10 megabytes of disk space, Coherent can reside with DOS. So you can keep all your DOS applications and move up to Coherent. You can also have it running faster, learn it faster and get faster overall performance. All because Coherent is small. Sounds beautiful, doesn't it?

But small wouldn't be so great if it didn't do the job it was meant to do.

LESS IS MORE!	Coherent For the IBM-PC/AT and compatible 286 or 386 based machines.	Santa Cruz Operation's XENIX 286, Version 2.3.2
No. of Manuals	1	8
No. of Disks	4	21
Kernel Size	64K	198K
Install Time	20-30 min.	3-4 hours
Suggested Disk Space	10 meg	30 meg
Min. Memory Required	640K	1-2 meg
Performance*	38.7 sec	100.3 sec
Price	\$99.95	\$1495.00

*Byte Exec benchmark, 1000 iterations on 20 MHz 386.
Hardware requirements: 1.2 meg 5¼" or 1.4 meg 3½" floppy, and hard disk. Does not run on Microchannel machines.

EVERYTHING UNIX WAS MEANT TO DO.

Like the original UNIX, Coherent is a powerful multi-user, multi-tasking development system. With a complete UNIX-compatible kernel which makes a vast world of UNIX software available including over a gigabyte of public domain software.

Coherent also comes with Lex and Yacc, a complete C compiler and a full set of nearly 200 UNIX commands including text processing, program development, administrative and maintenance commands plus UUCP.

CRITICS AGREE: IT'S AN INCREDIBLE VALUE!

"Mark Williams Co. seems to have mastered the art of illusion; Coherent comes so fully qualified as a UNIX clone, you find yourself thinking 'I can't believe it's not UNIX.'"

—Sean Fulton, UNIX Today!,
November 26, 1990

"...(Coherent) may be the best thing that has happened to UNIX yet."

—William Zachmann, PC Week,
November 5, 1990

"If you want to come as close as you can to real UNIX for a low price, COHERENT can't be beat."

—Warren Keuffel, Computer Language
Magazine, November 1990

"If you want a UNIX-like development and learning system for less than \$100...I don't see how you can go wrong with Coherent."

—David Fiedler, BYTE Magazine,
November 1990

EXPERIENCE, SUPPORT AND A 60-DAY MONEY BACK GUARANTEE.

Wondering how something as good as Coherent could come from

NEW COHERENT RELEASE 3.1 NOW WITH...

- elvis: vi editor clone
- SCSI (Adaptec AHA 154x series and more on the way) and ESDI support
- UUCP Bulletin Board System
- RAM disk support
- And much, much more!

OVER 10,000 SATISFIED USERS!

nowhere? Well it didn't. It came from Mark Williams Company, people who've developed C compilers for DEC, Intel, Wang and thousands of professional programmers.

We make all this experience available to users through complete technical support via telephone. And from the original system developers, too!

Yes, we know \$99.95 may still be hard to believe. But we've made it fool-proof to find out for yourself. With a 60-day money-back no-hassles guarantee.

You have to be more than just a little curious about Coherent by now. So why not just do it? Pick up that phone and order today.

You'll be on your way to having everything you ever wanted in UNIX. And for a lot less than you ever expected.

1-800-MARK WMS

(1-800-627-5967 or 1-708-291-6700)

FAX: 1-708-291-6750

60-DAY MONEY BACK GUARANTEE!



**Mark Williams
Company**

60 Revere Drive
Northbrook, IL 60062

*Plus shipping and handling. Coherent is a trademark of Mark Williams Company. UNIX is a trademark of AT&T. XENIX is a trademark of Microsoft.

Big

Get It All.

When you need it all, the ACCESS Plus 386-25 System from Computer Mail Order gives you what you need. From the multi-tasking flexibility of an 80386 processor to the speed of a 32-bit data path and much more. And every ACCESS Plus 386-25 comes with MS-DOS already installed. That means you'll be up and running in the time it takes to get it out of the box.

This system is packed with all the features a power user needs. The only thing it *doesn't* have is a prohibitive price. And at CMO, our technicians will customize your ACCESS Plus 386-25 to meet the applications you need. It's like having a personal computer consultant — free! Your ideal system is just a phone call away.

Hardware reliability is something you want to be able to take for granted. And the ACCESS Plus 386-25 lets you do just that. But for added peace of mind, we offer you a full money-back guarantee. (But we know you won't need it.)

At CMO, We Know.

We know what a personal computer user needs. We know what makes a good system. We know what makes a system affordable. But most important, we know service. We've been serving and servicing the industry for ten years — since the very beginning of the personal computer revolution. We have the experience to know.



**Computer
Mail Order**

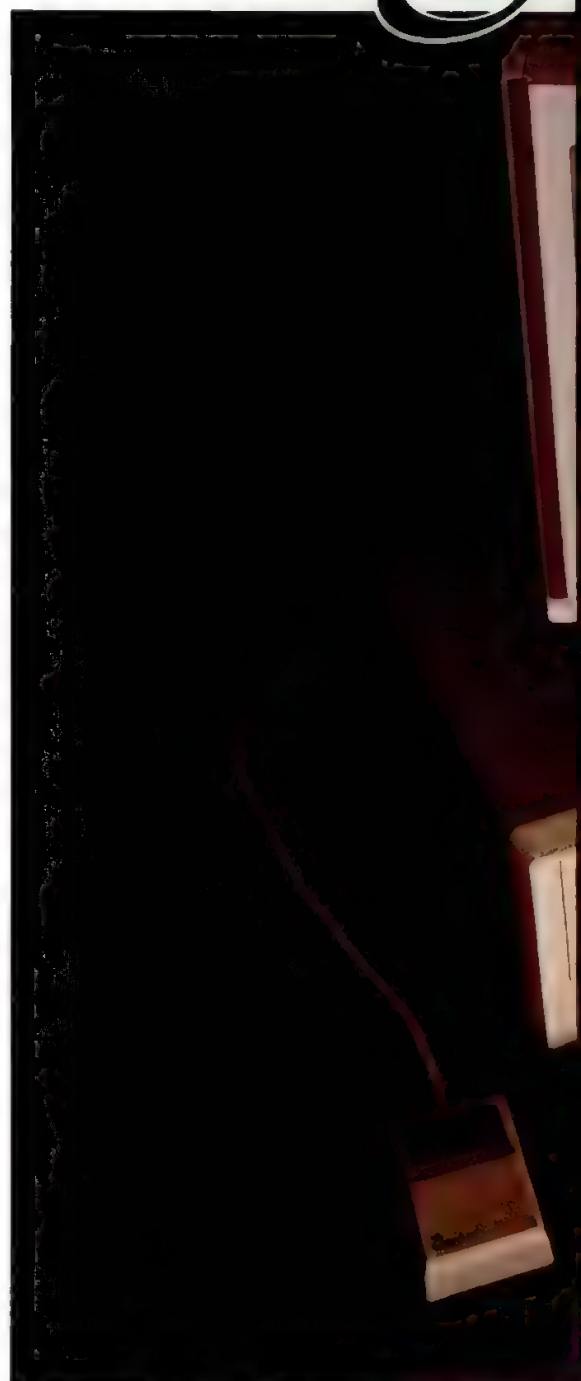
1.800.233.8950

Fax 1.717.327.1217

**101 Reighard Avenue
Williamsport, PA 17701**



Little



Power



e Price

#1 Software
Microsoft Windows 3.0
only \$89!

Access Plus 386-25 Complete System

Intel 80386 Microprocessor
25 MHz or 10 MHz Clock Speed
43.2MB, 28Msec IDE Fixed Disk Drive
1MB of Memory, Expandable to 8MB
Teac 1.2MB or 1.44MB Floppy Disk Drive
256K VGA Adapter, Expandable to 512K
Two Serial, One Parallel and One Game Port
One 32-bit, Five 16-bit and Two 8-bit
Expansion Slots
12-inch Flat Paper White VGA Monitor
Microsoft-Compatible Serial Mouse
Keytronics 101-Key AT Style Keyboard
Digital Display Desktop Cabinet
220 Watt UL-Approved Power Supply
MS-DOS 3.3

Free!

Maxell 10-pak Hi-Density Diskettes
Mousepad
6-Outlet Surge Protector
One Year TRW On-Site Service
30-Day Money Back Guarantee

Power Options

Monitor	12-inch	14-inch	14-inch	14-inch
Hard Drive	VGA Mono	VGA Mono	VGA Color	Super VGA
43.2 MB IDE	\$1799	\$1829	\$2039	\$2099
89.1MB IDE	\$1949	\$1979	\$2189	\$2249
143MB IDE	\$2279	\$2309	\$2519	\$2579

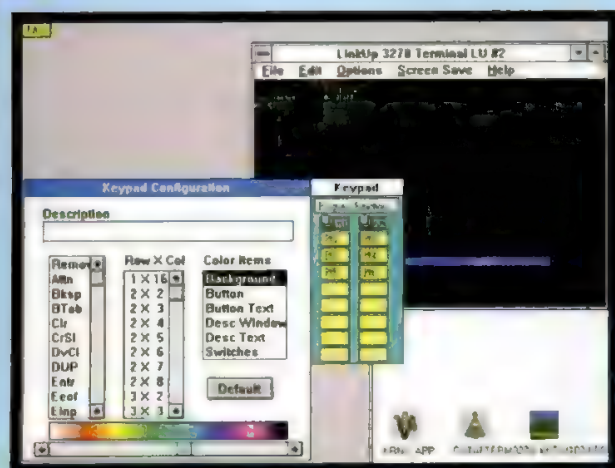
Prices include same standard options

**Call about our complete
line of XT's, AT's,
Laptops, SX's, 386's,
486's, Hardware,
Software,
and Accessories.**

CIRCLE 516 ON READER SERVICE CARD Source Code P104

WINDOWS 3.0

3270 TERMINAL EMULATORS



Chi Corp. uses interesting icons and displays throughout its *LinkUp 3270 COAX Windows UniSession*. The keypad shows a representation of toggle switches that move as you select certain options, and the keypad configuration menu lets you create useful displays.

you to change the model of the emulated terminal on the fly.

The emulation program supports the IRMA keyboard map for emulating 3270 keyboards on 83- and 101-key PC keyboards. Like the terminal emulation, the keyboard map is selectable from the install program or by editing the ASCII configuration file; you can't change the keyboard map on the fly either. Chi also markets a very nice 3270 keyboard for the PC that maps to and looks like a real 3178 or 3179 terminal display keyboard.

LinkUp functions as only a simple CUT-mode terminal emulator when connected coaxially to a terminal cluster controller. In the CUT-mode type of connection, *LinkUp* basically functions as a dumb terminal. If you need DFT sessions, you can use the gateway solu-

tion from Chi. DFT mode will give you greater control over communications with the mainframe. In this architecture, the workstations running under *Windows* use a NetBIOS DLL to talk to the gateway machine that communicates with the host.

You can manually or dynamically select the fonts from a menu. However, when we resized the window, the emulator put a great deal of black screen space around the session window, making it confusing to the eye. Because we had chosen smaller fonts, the emulator by default left the extra space blacked out. You can resize the window to get rid of most of the black space, but that's a step not required by the competing programs.

LinkUp offers Clipboard support for editing *Windows* sessions. To use this, you simply move the mouse cursor over the window holding the terminal session, then select the edit function from the menu

bar. You next choose the copy function, go to another application supporting the Clipboard interface, and paste the session screen to the applications screen.

DEAD-END ICONS

The *LinkUp* software combines interesting and well-designed graphical elements with some puzzling dead-end elements. One section of the screen contains three icons leading nowhere. The on-screen keypad is nice to look at and easy to use, but it doesn't include macro support, and we couldn't exit some keypad options.

Despite these program configuration problems, which we hope a new release will solve, *LinkUp* was fast and solid when we used it in the terminal emulation mode. It consistently moved data faster than other CUT-mode emulators.

Chi's technical support staff for the *LinkUp* products has a toll-free number and is available from 7 A.M. to 5 P.M. M.S.T. If you need updates or a fix for the software, the company's BBS is an accommodating source.

If the company fixes a few bugs, Chi's fast and affordable *LinkUp 3270* emulator for *Windows* could be a real value. Chi has a strong reputation and offers good support for its products.

Netlogic W3270 Support Package

Netlogic's \$249 *Netlogic W3270 Support Package* is a *Windows 3270* program with a twist. Like the other packages, it offers 3270 terminal emulation under *Windows*, but instead of focusing on terminal emu-

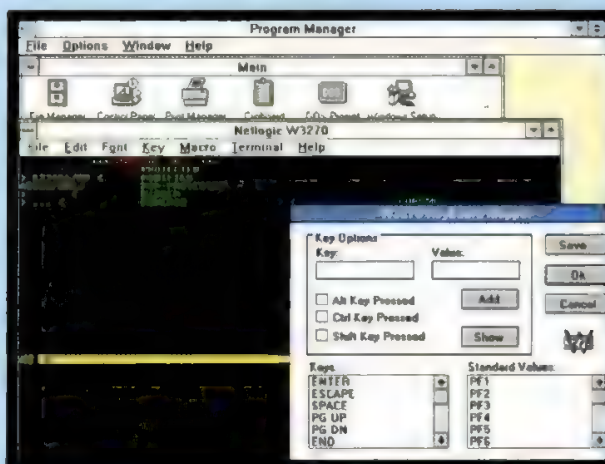
PC MAGAZINE FACT FILE



**LinkUp 3270
COAX Windows
UniSession,
Version 5.01**
Chi Corp., 31200
Carter St.,
Cleveland, OH
44139; 800-828-
0599, 216-349-
8600.

List Price: \$225; coaxial adapter, \$470.
Requires: 60K RAM, *Windows*, Version 3.0.
In Short: A few unfortunate bugs marred this otherwise fast software containing particularly nice fonts, Clipboard support, and icons. The interface includes a few extra steps that aren't necessary in the other packages. The company has a good track record, and the next version should be a good value.

CIRCLE 430 ON READER SERVICE CARD



The *Netlogic W3270 Support Package* isn't strong on screen features. You don't get an on-screen keypad, just the keyboard remapping tools shown here. The program, however, offers an excellent programming environment for developers.

Out of the prairie comes proof that a higher level of communication has arrived.

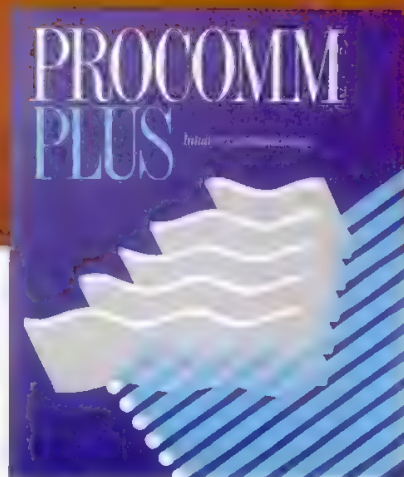
Presenting the New Version of PROCOMM PLUS.

Leaving a very big impression on the field of communications is what PROCOMM PLUS has always done best. But today, it's done one better.

PROCOMM PLUS 2.0. The new version of the best-selling communications software in the world. With internal Zmodem, an enhanced ASPECT script language with hundreds of new commands, and script compiling for much faster execution speed; an enhanced dialing directory with many new features; a time-saving Filename Clipboard (Patent Applied For); 33 terminal emulations with 132 column and full EGA/VGA support; and much more.

If you own PROCOMM PLUS, you can upgrade to PROCOMM PLUS 2.0 for just \$39.00 by calling toll-free 1-800-333-4559. So call today. You'll get computer communication in its highest form. For a very down-to-earth price.

See your dealer today for PROCOMM PLUS 2.0. Current PROCOMM PLUS users: call 1-800-333-4559 now to upgrade.



DATASTORM
DATASTORM TECHNOLOGIES, INC.

CIRCLE 504 ON READER SERVICE CARD

P.O. Box 1471 • Columbia, MO 65205 • 314.443.3282



For once, an announcement that will have businesspeople jumping into windows.

Until now, a lot of businesses have been hesitant to take the plunge into Windows. People have wondered, for instance, whether critical applications and viable communications would become available.

Well, if we may be so bold, we'd like to give you a little push – by introducing you to DCA's new IRMA™ WorkStation for Windows.

A BREAKTHROUGH IN 3270 CONNECTIVITY: IRMA WORKSTATION FOR WINDOWS.

In the Windows 3.0 operating environment, only IRMA WorkStation for Windows gives you a choice of single (CUT) or multiple (DFT) sessions via coaxial cable, remote SDLC or token-ring connections, as well as asynchronous connections.

It also gives you 3270 terminal, 3270 printer and asynchronous terminal emulations, and an extensive range of 3270 and asynchronous file transfer protocols, including DCA's and IBM's. Both DCA and IBM hardware are supported, as well.

All of which means that you won't have to keep reinvesting in new software as your business's needs change.

In addition to its tremendous flexibility, IRMA WorkStation for Windows is quite sim-

ple to use, which helps boost productivity.

For instance, mainframe data can be directly embedded into a word processor or spreadsheet, using DCA's QuickScript™ and Windows Dynamic Data Exchange.

Only IRMA WorkStation for Windows supports APPC and supplies you with a user interface that conforms to IBM's SAA/CUA standard. It also provides you with a transparent migration path to OS/2®, using DCA/Microsoft® Select™ Communications Workstation.

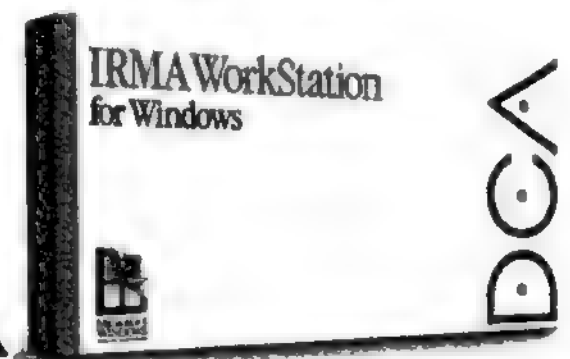
TRADE UP TO THE MOST FEATURE-RICH SOLUTION FOR ONLY \$149.

Best of all, from now until March 29, 1991, you can trade in your old 3270 communications software – regardless of who you bought it from – and receive IRMA WorkStation for Windows for just \$149 (suggested retail price \$495). If, within 60 days, you're not completely satisfied, return it for a full refund. For more information or to order, call **1-800-348-DCA1, ext. 66A.**

It's easy. Just take a deep breath. Close your eyes, if you feel like it.

And jump.

DCA





PERFORMANCE TESTS: WINDOWS 3270 TERMINAL EMULATORS

You pay a small penalty in throughput rate when you run a 3270 terminal emulator under *Windows*, but you get outstanding capabilities.

MULTISESSION TESTS

The tests shown are intended to stress multi-LU cluster and single-terminal emulation display sessions. The multi-LU test can connect to a maximum of 127 logical units.

The **Maximum Outbound** test determines the maximum aggregate outbound data capacity of multiple-terminal sessions. Outbound traffic alternates between 512- and 1,024-byte blocks.

The **Maximum Inbound** test determines the maximum aggregate inbound data capacity of multiple terminals. Inbound traffic from the workstation to the host is generated in response to a read buffer command and consists of a full screen (1,920 bytes) per request.

The **Simple Transaction** test simulates a simple, interactive transaction between the host application and multiple terminal sessions. The transaction consists of a single outbound screen. The test establishes an outbound-to-inbound data ratio of 4 to 1. It exercises a variety of 3270 field attributes, including protected, nonprotected, 'highlight, numeric, and modified, and it tests the SNA segment assembly operation.

The **Complex Transaction** test simulates a complex interactive transaction between the host application and multiple terminal sessions. The transaction is divided into three output screens. The test establishes an outbound-to-inbound data ratio of 7.5 to 1. It exercises a variety of 3270 field attributes, including protected, nonprotected, highlight, numeric, and modified.

• Reported for comparison.

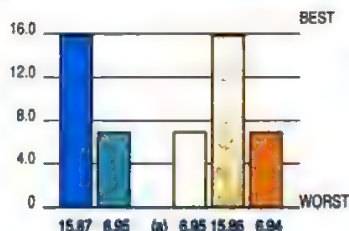
(a)—Not applicable: The product does not support the mode of operation tested here.

(b)—Not applicable: The product ran into an unresolved problem during the test.

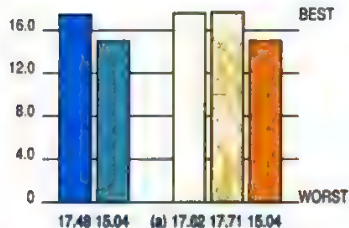
Throughput (kilobits per second)

MLT: 5 CUT Sessions

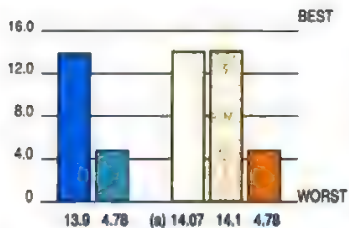
Maximum Outbound



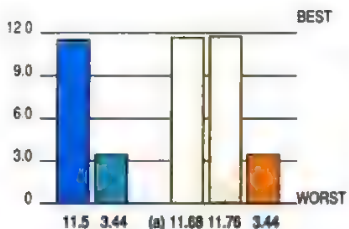
Maximum Inbound



Simple Transaction



Complex Transaction

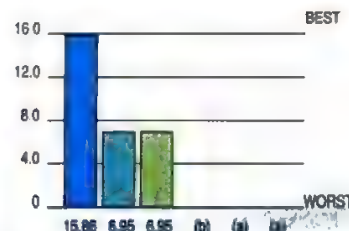


• Extra! for DOS
IBM Workstation for Windows
Purvis
Extra! for Windows
LinkUp 3270 COAX Windows UnSession
Netlogic W3270 Support Package

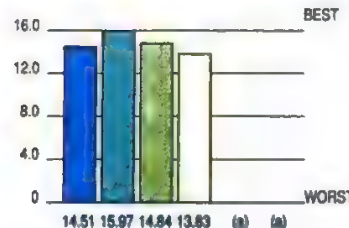
Throughput (kilobits per second)

DFT: 5 Sessions

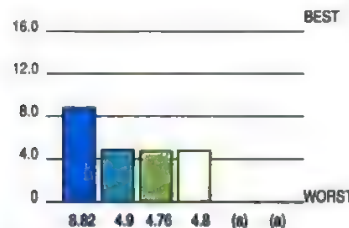
Maximum Outbound



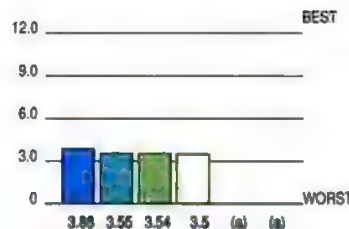
Maximum Inbound



Simple Transaction



Complex Transaction



• Extra! for DOS
IBM Workstation for Windows
Purvis
Extra! for Windows
LinkUp 3270 COAX Windows UnSession
Netlogic W3270 Support Package

CONTINUES



Look at 3270 connectivity through our Windows.



If you need to connect PCs to an IBM® mainframe, there are some clear advantages to doing it with Attachmate's new EXTRA!™ for Windows.

It's built from the ground up as a Microsoft® Windows application, combining EXTRA!'s famous power and versatility with Windows' legendary ease of use.

Connecting to the mainframe is as simple as pointing to a dialog box and clicking the mouse. File transfers? A quick pull-down menu selection. Multiple sessions? Up to 26 of them, each in its own window.

But EXTRA! for Windows doesn't stop with the friendly features of Windows. It adds a few of its own.

For example, SmartPad™ lets you define buttons for various actions on an on-screen keypad. Define buttons for

logging on, invoking macros, entering PF keys, and launching special functions.

And we've put all of our connectivity experience into EXTRA! for Windows. So it's much more than a pretty interface — it's fast and reliable.

EXTRA! for Windows supports coax (CUT and DFT) and LANs — including IBM's Token Ring Interface Coupler (TIC). And it's smart enough to maintain your connection, even when you run non-Windows applications.

Call 1-800-426-6283 now for your free demo disk. And open the window to better PC-mainframe connections.

EXTRA!™ FOR WINDOWS

Attachmate

Quality micro-mainframe solutions.
Attachmate Corporation

13231 SE 36th Street • Bellevue, WA 98006 • (206) 644-4010

© 1990 Attachmate Corporation. All rights reserved. Printed in USA.

EXTRA! and SmartPad are trademarks of Attachmate Corporation. IBM and PROFS are registered trademarks of International Business Machines Corporation. Microsoft is a registered trademark of Microsoft Corporation.

lation, its features center more on its interface to application programs. The company has coined a new term for the program's main function: It calls the package a 3270 server, a device that allows applications to interface transparently with the host. It accomplishes this through its DLL functions that give applications access to 3270 communications. Though the documentation and help menus seem incomplete, Netlogic's terminal emulator displays larger fonts than the competition.

Netlogic doesn't sell hardware with its software; instead you must purchase an adapter from another company. If you need multiple copies of the software, the price drops based on the number you purchase. For example, if you purchase between 10 and 24 copies, the cost dips to \$225 per copy.

Netlogic runs over industry-standard 3270 hardware from DCA, Attachmate, and IBM. It uses these adapters to connect to the host via a CUT session emulating a dumb 3270 terminal. The emulation program supports multiple CUT sessions through MLT mode. MLT, unlike the multiple DFT feature of other programs, allows for only one CUT session in the window environment. You switch to the next CUT terminal session via a hotkey combination.

If you want multiple DFT sessions, you can load Netlogic's HLLAPI DLL together with DOS 3270 terminal emulation products from Attachmate, DCA, or IBM. Netlogic will use the HLLAPI TSRs included with the DOS 3270 products



FACT FILE

Netlogic W3270 Support Package, Version 2.1

Netlogic Inc., 232 W. 15th St., New York, NY 10011; 212-989-5051. List Price: \$249. Requires: 32K

RAM; Windows, Version 2.0 or later.

In Short: Netlogic makes a great third-party 3270 applications generator, allowing applications to communicate with the host transparently. It also offers the largest screen fonts and a function to enable fast screen updates. However, the help screens and documentation are incomplete. Also, the program didn't perform well in testing and lacks support for hotspots and hotlinks. But if you're an applications developer trying to interface 3270 under Windows, the program is worth considering.



CIRCLE 421 ON READER SERVICE CARD

WINDOWS 3.0 3270 TERMINAL EMULATORS



PERFORMANCE TESTS: WINDOWS 3270 TERMINAL EMULATORS

SINGLE-SESSION TESTS

These tests report the aggregate time needed to set up and display the test characters on the display terminals.

The **Mixed Display** test evaluates a variety of 3270 terminal attributes, including protected, non-protected, highlight, hidden, numeric, and modified fields. The test menu display in the LU2 terminal emulation waits for user input and sends a sense code to the host emulator if the fields report an error.

The **Formatted Protected Fields** test checks the 3270 emulation display to see if every addressable

area on the screen can be protected. The tester then moves the cursor around the screen and tries to modify the current display position.

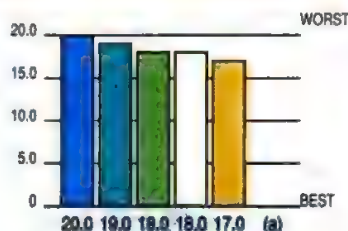
The **Universal Character Set** test displays a full 3270 character set and compares it with the image in the host emulator.

The **Sliding Alpha Pattern** test verifies that the display session acknowledges the commands received. The test is shown as a repeatable 81-character string in a 1,920-byte screen buffer.

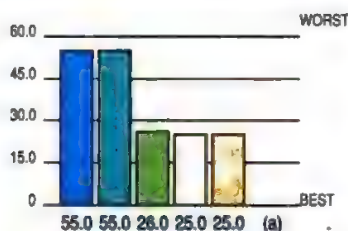
The **Extended Attributes 1 and 2** tests evaluate the ability of the LU2 display software to handle a 3270 terminal's advanced and basic color capabilities with extended highlighting.

Elapsed Time (seconds)

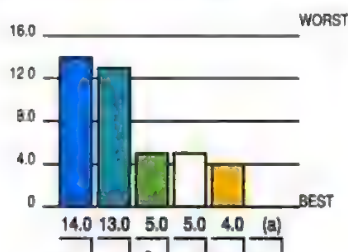
Mixed Display



Formatted Protected Fields



Universal Character Set

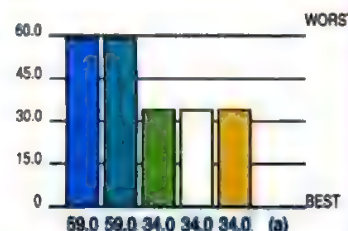


IRMA Workstation for Windows
Netlogic W3270 Support Package
LinkUp 3270 COAX Windows
Extra! for DOS
Extra! for Windows
Rumba

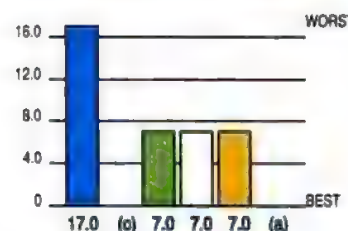
* Reported for comparison.

Elapsed Time (seconds)

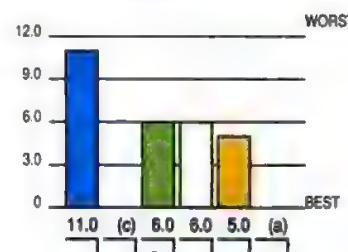
Sliding Alpha Pattern



Extended Attributes 1



Extended Attributes 2



IRMA Workstation for Windows
Netlogic W3270 Support Package
LinkUp 3270 COAX Windows
Extra! for DOS
Extra! for Windows
Rumba

(a)—Not applicable: The product does not support the mode of operation tested here.
(c)—Not applicable: The product does not support extended attributes.

To test these emulators, we ran *Microsoft Windows 3.0* on a Unisys PW[®] 386 33-MHz PC. The Unisys machine attached to both a Memorex Telex 1174 and an IBM 3174 Model 22R cluster controller using an IBM SDLC adapter. Both controllers connected to a Compaq Deskpro 386 20-MHz PC running a program called *SNA Development and Test Facility (SDTF)*, marketed by Applied Computer Technology. We used an LM1 protocol analyzer from Progressive Computing to decode SDLC (Synchronous Data Link Control) and SNA (Systems Network Architecture) frames.

The \$15,000 *SDTF* software emulates an IBM mainframe computer on a PC and provides a consistent and economical platform for the development and testing of SNA-compatible hardware and software products. The software emulates an IBM SNA environment at the OSI (Open Systems Interconnection) Data Link Control through the Presentation layers. *SDTF* contains a number of test programs and utilities to debug and test 3270 display features as well as to perform LU1 and LU3 printer testing. Companies wanting more information on

the ACT *SDTF* tests used by *PC Magazine* can contact Applied Computer Technology at 214-271-6550.

SDTF has two test suites for SNA protocols, 3270/RJE and LU6.2, that work with either Token-Ring or SDLC connections. Included in the tests are test specifications, source coding, and documentation for performing in-depth analysis of the results.

Test results for *LinkUp* are not shown for DFT sessions since *LinkUp* will function only in CUT mode using direct coaxial connections from the workstations to the host. For DFT mode, you need to set up a separate machine to act as a gateway. *Netlogic's* DFT results are also not shown since it, too, connects to the host using CUT sessions. If you want DFT sessions, you need to use *Netlogic's* HLLAPI TSR in tandem with DOS 3270 terminal emulation products from Attachmate, DCA, or IBM. CUT results for *Rumba* aren't included because Wall Data doesn't support CUT-mode operation in the program

from these companies to move multiple DFT session information into its *Windows* session. In this way, you can make these products, which formerly worked strictly as a PC-to-3270 link in the DOS environment, take advantage of the *Windows* environment as well.

The *Netlogic* software gives application programs access to 31 special DLL functions for 3270 communications. Applications gain the ability to transfer files through the popular IBM *IND\$FILE* mainframe utility, along with DDE function support that allows them to share windows of text with the host. The software also enables a programmer to create hotspots and hotlinks for many applications.

BIG WORDS FOR WINDOWS

Netlogic's terminal emulation program lets you use the scroll bars to move across fonts too large for the window, allowing you to read text outside the window's edge. The dynamic font selection feature also works well as it adjusts the text to fit the window.

An interesting feature of the product is the large fonts it lets you select. All these packages have selectable fonts so that you can zoom in and out of the text, but *Netlogic* displays the largest fonts we've seen—a boon for anyone with a visual impairment. We encountered several problems after selecting the larger fonts, however: First, we tried without success to move the cursor to different locations on the resized window; eventually we discovered that if you turn off the Always Show Cursor option, you're able to move around in the large-font-size windows.

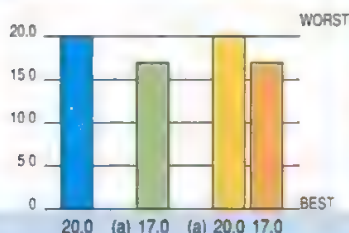
NOT READY FOR PRIME TIME

When we ran the program in the LAN Labs, *Netlogic's* terminal emulator had the look and feel of a program not quite ready for prime time. Several undocumented functions were displayed in the menu bar. And in our performance test, *Netlogic* didn't compete well; its score was comparable to *IRMA WorkStation's* at the bottom of the list. We also found that it didn't support extended attributes, which the other 3270 terminal emulators reviewed here did.

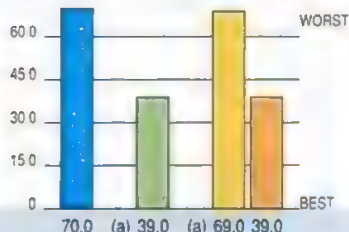
One undocumented function we discovered is called *direct controller update*. *Netlogic's* emulation software moves data to and from the host computer without sending instructions to the cluster controller, allowing for some very fast screen

Elapsed Time (seconds)

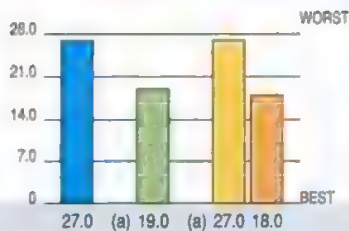
Mixed Display



Formatted Protected Fields

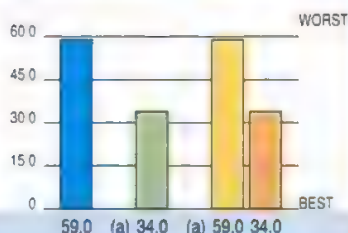


Universal Character Set

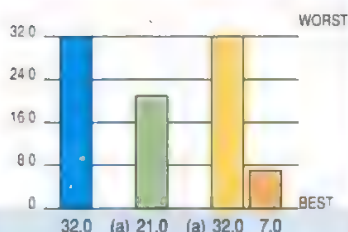


Elapsed Time (seconds)

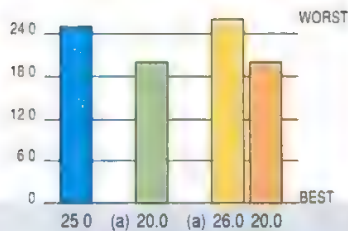
Sliding Alpha Pattern



Extended Attributes 1



Extended Attributes 2



CONTINUES

ZEOS[®] '486

Complete 25 MHz system Only \$3995,

THE CHOICE IS YOURS!

**Take your pick:
Order your own
ZEOS 25MHz or
33MHz '486 EISA
system at new low
prices.**

**Choose from our
broad selection
of money saving
packages or let us
custom configure a
system just for you.**

**Whatever you decide,
you'll see why ZEOS
is the technology
leader in high speed
'486 EISA systems.**

**Call now to order!
800-423-5891**



EISA!

33MHz system Only \$4995.

THE POWER AND THE PROMISE DELIVERED!

Available right now! ZEOS harnesses the incredible power of the '486. Then we combine it with all the advantages of the EISA bus. The result is the finest computing platform you can buy. And it's ready for you *today!*

THE POWER OF THE '486

The '486 chip is a technological marvel.

It includes not only an advanced processor core but also a built-in cache controller, memory cache, floating point math coprocessor, and an advanced memory management unit. Running 40%-50% faster than similar '386 chips, the '486 makes short work of any processor-intensive applications. But where does it *really* shine?

THE PROMISE OF EISA

It really shines when ZEOS combines it with the EISA 32-bit bus! The '486 is a 32-bit processor. It runs 32-bit software. And, to bring out its full potential, it *demands* a 32-bit bus. That bus is EISA. It is the perfect bus for the '486 and it is the only bus you should consider if you are purchasing a '486 system. Why?

Compatibility for starters. Just as the '486 processor offers full compatibility with all of your software, the EISA bus accepts your present 8-bit and 16-bit expansion cards and runs them without a hitch. And then the performance *really* kicks in.

We're talking about 32-bit hardware performance. It's the reason the '486 was invented. To unleash the potential of 32-bit software *and* hardware. And ZEOS gives you both.

ZEOS '486 EISA. INCREDIBLE VALUE!

Price, Performance, Quality and Support. *Value.* These are the ZEOS hallmarks. Remember, it was ZEOS that invented 24 Hour a Day Toll Free Technical Support. Others have since copied us, but *no one* can match ZEOS support. It's the best in the business.



And that's only the start of your ZEOS Customer Satisfaction package. Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy. You're going to be very satisfied. We don't just say it. *We Guarantee It!*

ORDER YOUR OWN ZEOS '486 EISA TODAY!

Ordering your own ZEOS '486 is easy. Simply pick up the phone and give us a call at 800-423-5891. For a personal workstation, file server or *any* high performance application, your ZEOS '486 EISA is the perfect solution. That's not just a promise. That's a *Guarantee.*

ORDER NOW TOLL FREE 800-423-5891

DON'T FORGET THE OPTIONS!

ZEOS has them all. Starting with blazing 32-bit EISA cards and every other high performance option you could want. Choose from a huge selection of hard drives, video packages, and more. Whatever you need to equip your system to your exact needs. On-site service is available too. Call 800-423-5891 for details.

**THE COMPLETE
25MHz ZEOS '486
EISA DESKTOP!
WITH 85MB DRIVE,
2MB MEMORY
& MORE.**

**ONLY \$3995
33MHz Only \$4995**

- Genuine Intel® 80486 25MHz or 33MHz CPU with built-in Cache and Math Coprocessor. 8/25MHz (or 33MHz) Dual Speed.
- Eight 32-bit EISA expansion slots. Also accepts 8-bit & 16-bit cards.
- 2MB of High Speed DRAM, expandable to a Total of 32MB.
- Ultra Fast 85MB IDE Hard Drive, Teac® 1.2MB Floppy Drive.
- Genuine Hercules® brand graphics controller. 14" High-Res Amber Display with Tilt/Swivel base.
- ZEOS/RS 101 key Space Saver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel & Game port.
- Rugged ZEOS 5-bay desktop case.
- 250 Watt TurboCool® Power Supply for additional expansion and increased component life.
- Plus Your ZEOS Absolute Satisfaction 30 Day Money Back Guarantee, Full One Year Limited Warranty and Express Parts Replacement.
- 24 Hour a Day Toll Free Technical and Sales Support on your ZEOS Hotline.

**128K Cache Systems
also available.**

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders: 612-633-1325
Minnesota: 612-633-4591

Hearing Impaired:
800-228-5389

Outside US and Canada:
612-633-6131

MasterCard, VISA, Am Exp,
Z-CARD and COD
Open 24 Hours a Day,
365 Days a year!



Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: 486 of Intel Corporation; ZEOS and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol: ZEOS

CIRCLE 389 ON READER SERVICE CARD



PERFORMANCE TESTS: WINDOWS 3270 TERMINAL EMULATORS

Despite the complexity of the test results for this review, the differences between products are consistent and easy to see. For further comparison, we included test results for the DOS version of one terminal emulator, Attachmate's *Extra!*, our Editors' Choice in two previous reviews of DOS-based and Token-Ring 3270 emulators (see "LAN Gateways, Part 2," *PC Magazine*, December 13, 1988, and "Direct Token-Ring to Mainframe Connections," January 30, 1990). The comparison shows that throughput rate is diminished somewhat when the 3270 terminal emulation products run under *Windows*, but the differences are small.

The chart is divided into multisession and single-session tests. The throughput rate reported in the multisession tests is measured at the PC emulating a mainframe host and is an aggregate of all the active sessions.

Only DCA's *IRMA Workstation for Windows* shows up in every category and test because it's the only product with the ability to perform every task. However, *IRMA* clearly doesn't move data as fast as the competing products, particularly in the Control Unit Terminal (CUT) mode.

For the Attachmate products *Extra! for DOS* and *Extra! for Windows*, running multiple Distributed Function Terminal (DFT) sessions results in slower throughput than running multiple CUT sessions under the Multiple Logical Terminal (MLT) mode of operation. The work of sequencing sessions under MLT takes place in the terminal controller. Under DFT, the PC running the terminal emulation must do this work, so the MLT sessions generally provide faster throughput than the DFT, (although *IRMA Workstation* showed the opposite result).

Chi's *LinkUp 3270 COAX Windows UniSession* works as a consistent performer in the CUT arena. If you use MLT, consistently good performance in CUT mode is an important consideration.

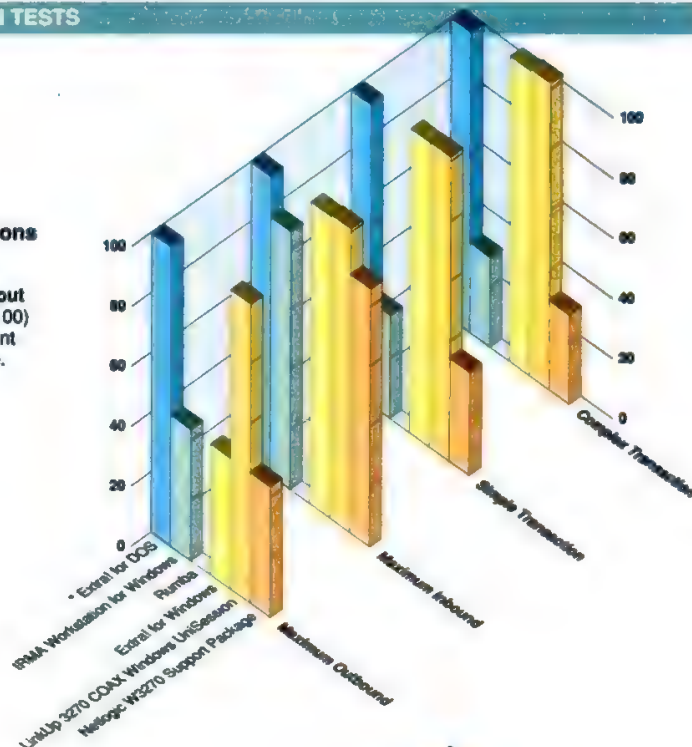
For the suite of single-session tests, we report results in seconds. We used elapsed time as a measurement because we wanted to test more than data throughput. These tests evaluate compliance to IBM 3270 standards as much as performance. The single-session display tests carry out the tedious task of checking to see whether the emulation handles 3270 DFT or CUT attributes. Elapsed time is the only measurement that makes sense in this context.

• Reported for comparison.

MULTISESSION TESTS

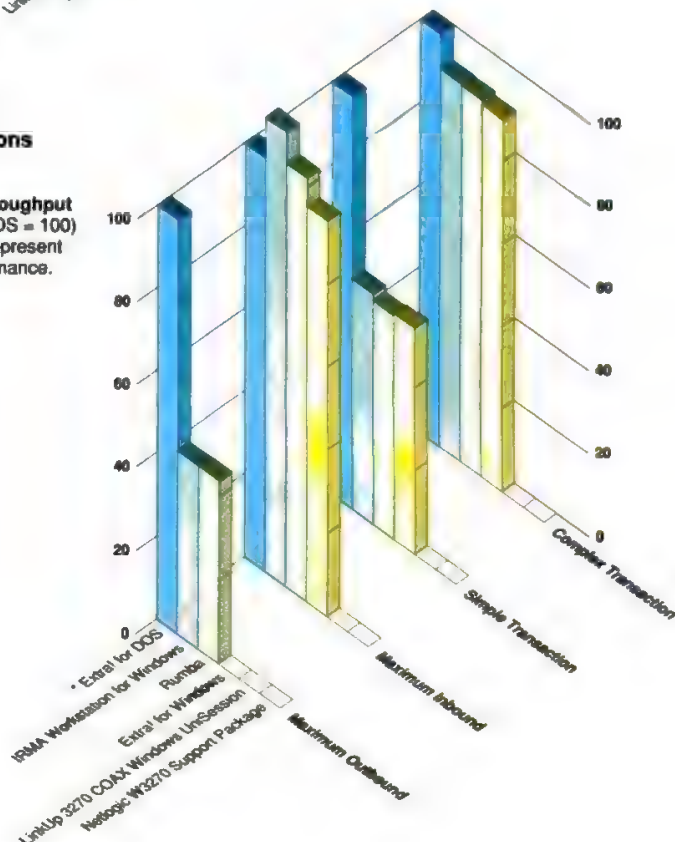
MLT: 5 CUT Sessions

Relative Throughput
(*Extra! for DOS* = 100)
Taller bars represent
better performance.

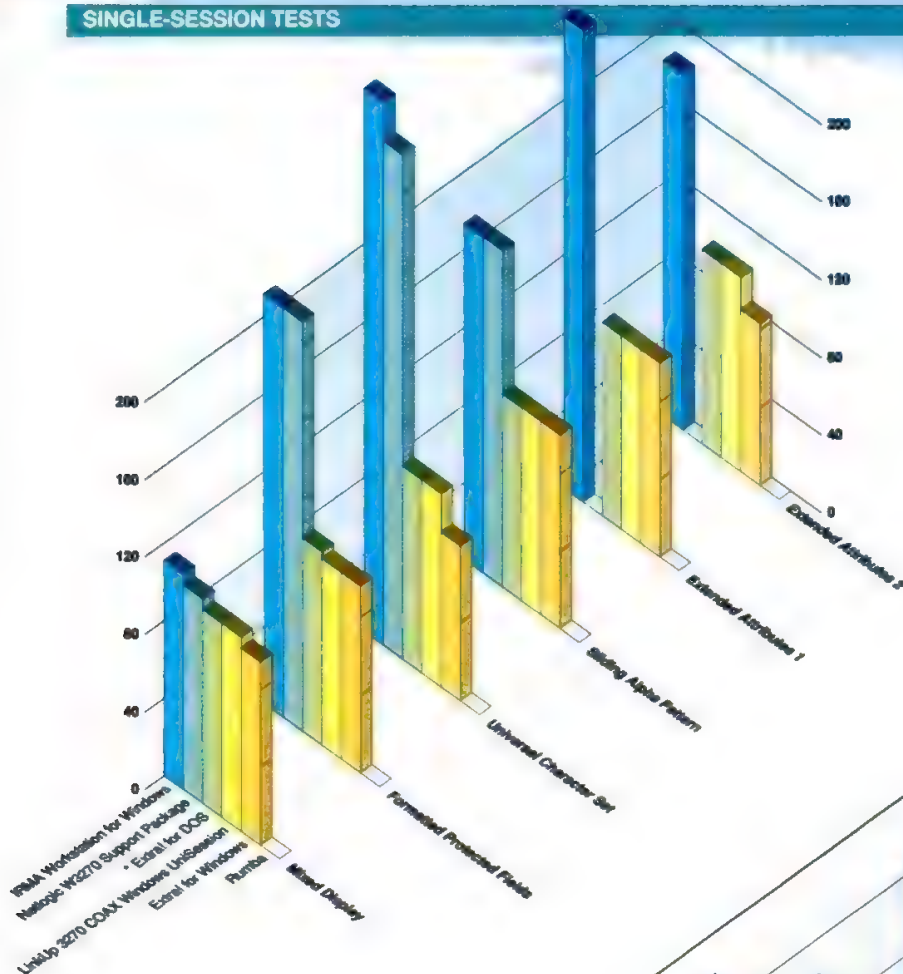


DFT: 5 Sessions

Relative Throughput
(*Extra! for DOS* = 100)
Taller bars represent
better performance.

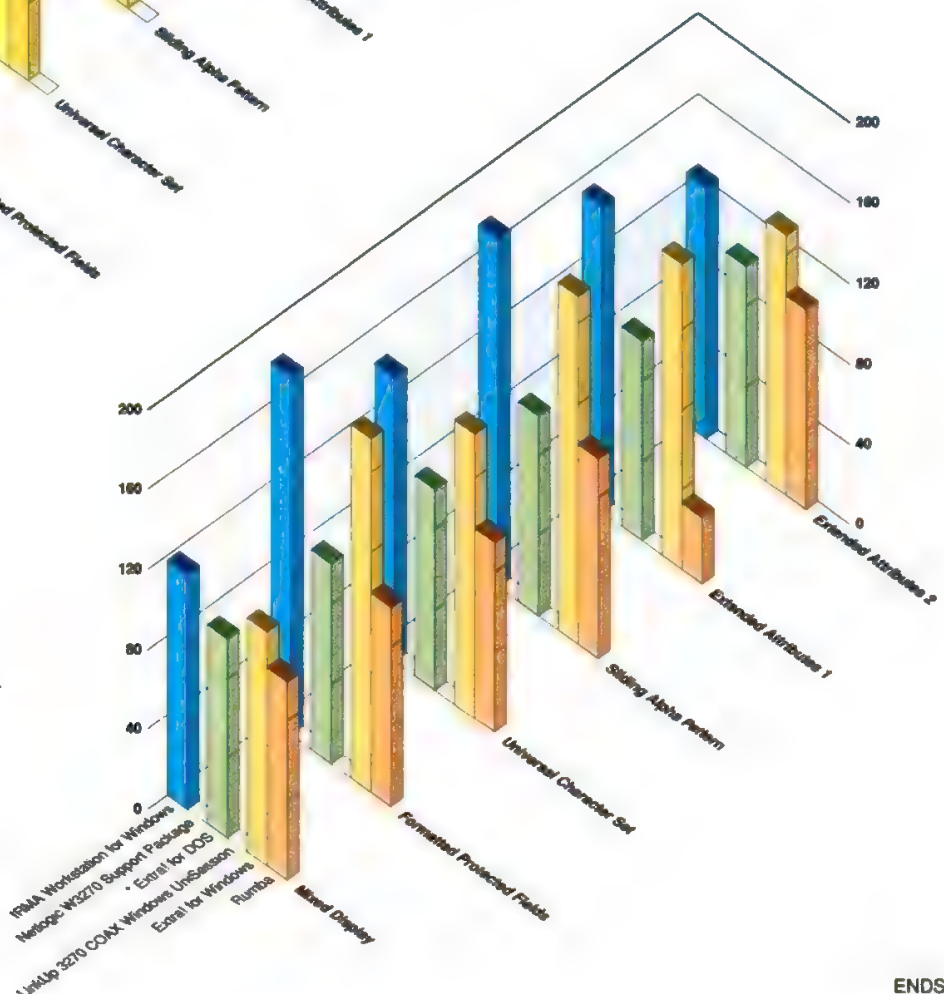


SINGLE-SESSION TESTS



DFT: 1 Session

Relative Times
(Extra! for DOS = 100)
Shorter bars represent better performance.



• Reported for comparison.

ENDS

updates. However, some cluster controllers don't work well if you update your terminal emulation session without sending the update to the controller. To prevent this problem, you turn on the direct controller update function.

Other options are left undocumented. The help menu doesn't show or support all of the parameters listed in the session menu bar. Bringing up the help screen while background tasks were being performed caused the session to hang, although the host session remained active.

The manual often misses defining some program parameters found in the menu bar. The documentation seems to assume that you know a lot about the product. As a final blow, the page numbers shown in the index don't agree with the text.

This means it's likely that you'll need to contact technical support at some point. Technical support operates from 9 A.M. to 6 P.M. EST. The service is free for purchasers of a Netlogic product, though the telephone call itself is not.

Netlogic offers an interesting package for system developers. But for someone just shopping for a 3270 terminal emulation product, it's not the top choice.



Rumba

Rumba, from Wall Data, leads a sweet dance but misses a step when it comes to LU2 CUT mode. Frankly, we don't understand why Wall Data didn't include CUT-mode operation in this \$495 program. It's the easiest form of terminal emulation to create, and users need CUT support to configure a cluster controller. In every other way, *Rumba* is an outstanding program. It was the only product to pass all the benchmark tests, including numeric field support. The numeric field attribute isn't critically important, but it's often used in data-entry screens.

WRITTEN WITH CARE

When you use *Rumba*, you get the feeling it was written with care. The system operates hassle-free.

Rumba installs easily, which is good because Wall Data doesn't include documentation. All the information on using the software is in the software. From the Windows program manager menu, you type A:\INSTALL and the program takes

When you use
Rumba, you get the
feeling it was written
with care. The system
operates hassle-free.

care of the rest. After installation, a window with five icons drawn in *Rumba*'s dance motif appears. The icons support a demonstration program, terminal operation, printer operation, a configuration utility called Fastpath, and a general icon for *Rumba* depicting dancing silhouettes.

The product's demonstration icon lists two options: overview and hotlinks. Selecting the overview option gives you a comprehensive demonstration of the power and features of *Rumba*. The hotlinks demo shows data being changed on the host display while a Microsoft Excel application reflects the changes.



Wait a minute.

The long modem wait is over. Announcing the arrival of our remarkably quick 9600EX modem.

So how quick is quick? With V.42bis, data can be compressed up to 400 percent, increasing throughput to as much as 38.4Kbps. Which means it keeps its telephone conversations short and saves you money on your phone bills. And while it communicates

quickly, it also communicates clearly. The 9600EX knows when data is being garbled and automatically retransmits, so your data arrives error free.

Plus, the 9600EX features full-compliance with V.32 and is downward-compatible with slower modems. And, like our entire family of modems, the 9600EX comes with a full, five-year warranty.



We strongly recommend running the demo program because you won't really understand the power of *Rumba's* terminal emulation software program without doing so. You'll find that the demonstration is the best source of information; the on-line help system doesn't supply a great deal of detail on the features.

The Fastpath feature of *Rumba* contains options that literally take control of your mouse cursor and help you to configure and start a terminal session. The program selects parameters for itself, prompting for keyboard input only when needed. This is an excellent feature for both experienced administrators and new users.

RICH SET OF FEATURES

Rumba offers a rich set of features, including hotlinks, hotspots, an on-screen keyboard mapper, and a macro editor. The software also provides editing support for the *Windows* Clipboard.

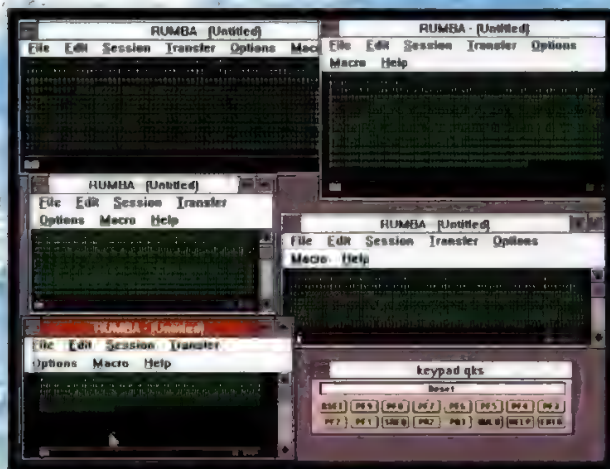
An optional software development kit (SDK) supports HLLAPI and DDE and includes the Asymmetric Tool Book. The \$6,500 SDK is object-oriented and looks like a high-level scripting language. The code created by the SDK is interpretive;

you can change parameters or variables right before runtime. The only problem is that it takes time to run the program because it has to compile as it goes. Thus, PCs connected to a mainframe through fast communications channels might not enjoy the full benefit of the connection speed if they run complex applications.

You get 90 days of hand-holding support as a startup service with the purchase of the SDK. Technical support for *Rumba* also runs toll-free for 90 days, operating from 6 A.M. to 5 P.M. P.S.T.

SMOOTH DISPLAYS

Rumba contains only seven fonts, but the displays work smoothly without noticeable interruption between the different



Wall Data Inc.'s *Rumba* uses colorful icons and well-designed graphics to create a pleasant as well as efficient working environment. The five DFT terminal sessions on this screen all display useful data.



Just a second.

All of this becomes even more remarkable when you consider the price of the 9600EX. Just \$799. It's a price, in fact, that rivals high-end 2400 modems. It's also an example of Intel's commitment to affordable quality.

For more information, call 800-538-3373. Or for information faxed to you, call 800-525-3019 and

request Doc. #9986. But don't wait, because with all the 9600EX offers, it will go in a second.

intel
The Computer Inside.™

CIRCLE 749 ON READER SERVICE CARD

Hassle-Free Printer Sharing

for the HP LaserJet II, IID, III and IIID



Here's how everyone in your office can have his own HP LaserJet without breaking the corporate budget.

It's called **SimplAN ServerJet**.

Simply plug the *ServerJet* into the 'Optional I/O' slot of your HP LaserJet. Stretch phone cable, even hundreds of feet, to each person's computer. Then, up to 10 people can simultaneously *whoosshh* documents to the LaserJet at speeds as fast as 115,200 baud.

No more wandering down the hall with floppy in hand.

Or borrowing someone else's LaserJet.

Or wasting time waiting to print.

The *ServerJet* lets **six, seven or ten** computers access your HP LaserJet. And because you may have printers other than HP LaserJets, ASP Computer Products delivers a complete line of printer sharing solutions.

Ultimately, you'll get your documents produced quicker. Bring ideas to life faster. And best of all, spend time using information instead of running around to print it.

To order your *ServerJet* or for more information call ASP at:

800-445-6190

ASP
ASP COMPUTER PRODUCTS, INC.

1026 W. Maude Ave., Suite 305 • Sunnyvale, California 94086

Phone: 408-746-2965 • FAX: 408-746-2803

SimplAN & ServerJet are trademarks of ASP Computer Products, Inc./HP LaserJet is a registered trademark of Hewlett-Packard Co.

CIRCLE 727 ON READER SERVICE CARD



FACT FILE

Rumba, Version 3.0
Wall Data Inc.
17769 NE 78th Pl.,
Redmond, WA
98052, 800-433-
3388, 206-883-4777.
List Price: \$495;
3270 coaxial
adapter, \$495.
Requires: 18.2K RAM; IBM-compatible
Token-Ring, NetBIOS, coaxial, or SDLC
connection; *Windows*, Version 3.0.
In Short: Simple, elegant, and carefully
programmed, *Rumba* is highly recommended.
The only program to pass all our performance
tests, it displayed the fastest response times
and throughput. It includes an automated
configuration program, Clipboard support,
asynchronous capabilities, software
development kit, and handy on-screen
keyboard and macro displays. The only major
drawback is that it doesn't support CUT
terminal mode operation.

CIRCLE 422 ON READER SERVICE CARD

screen sizes. The on-line keyboard screen mapper is useful for those of us with poor memories. The mapper display shows one of several available PC keyboard diagrams and a menu of 3270 keyboard functions. You can use the utility to remap the keyboard and to place special 3270 keyboard functions in an on-screen display.

Rumba includes a variety of macros designed to make it easier to use main-frame programs and to automate terminal functions. These macros work through the Quickstep feature, which displays a window containing buttons that can call as many as 48 macros. You create and edit the macros using the simple scripting language supplied with the software.

The benchmark tests for the multiple and single DFT sessions show that *Rumba* leads the pack. It consistently showed faster response times and greater throughput than the other 3270 DFT products.

Like the dance it's named after, Wall Data's *Rumba* has a lot of highs and lows. In many ways it's an excellent program. Organizations with their own programming staffs will find the SDK valuable. We don't understand the lack of CUT terminal emulation, and we wish for a little better on-line help, but many people will still be very happy with *Rumba*. ■

Frank J. Derfler, Jr., is workgroup systems editor of PC Magazine. Randol Tigrett is a project leader at PC Magazine LAN Labs.



Rock Solid.

PC BRAND

Finally, a computer company that specializes in
satisfied customers.

Rock Solid Quality,



PC BRAND

Rock Bottom Price.

"Not only does the system perform, look good and have competitive pricing, but it also has the "number-one" rated mail-order service and organization behind it. How can you go wrong?"

-Computer Monthly, PC Brand 286/16 Product Review

286/16MHz and 286/20MHz ISA Systems

286/16 and 20 Base Systems

Customize with the Video and Hard Drive options of your choice

- True 80286-16/20 w/ Zero Wait States
- Landmark Speed 20.6MHz (286/16), 26.7MHz (286/20)
- Norton SI 19.0 (286/16) 23.0 (286/20)
- 512K RAM (expandable to 8MB)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

16MHz **\$549**

20MHz **\$649**

286/16 and 20 Mono Packages

This preconfigured system includes all the features of our base system with:

- 512K RAM (expandable to 8MB)
- 40MB/25Ms Hard Drive
- 12" Mono Graphics Monitor
- Hercules Compatible Mono Graphics Card
- 1.2MB or 1.44MB Floppy Drive
- High Resolution Mouse

16MHz **\$969**

20MHz **\$1,069**

All Systems also Include: On-Site Service by TRW¹, Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features

- 80286-16, 80286 20 operating at 16MHz or 20MHz with Zero Wait States
- 512K RAM expandable to 8MB on the System Board
- 1:1 interleaved Hard/ Floppy Drive Controller, with 1MB second disk transfer rate
- 1 Parallel and 2 Serial Ports
- High capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery
- 80287 Co-Processor Support

Standard Features Cont.

- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, NOVELL, 3COM, and PCNET compatibility
- Built in System Board LIM 4.0EMS hardware
- 7 Slot Motherboard Design (5 16bit & 2 8bit)
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options

- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640 x 480)
- Super VGA Color (1024x768)

1-800-PC BRAND

TEL 1-800-722-7263 FAX 1-800-722-7392

PC Brand, Inc. 954 W. Washington St., Chicago, IL 60607
International Fax #312 633 2888 International Voice #312 226 5200
We are open Mon. thru Fri. 7am to 7pm, Saturday 8am to 4pm Central Time
MasterCard, VISA, Discover, PC Brand Direct Advantage MasterCard, Checks
& Approved P.O.s Accepted. Prices & specifications subject to change

¹TRW National Computer Maintenance Services Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details.

Rock Solid Warranty,



PC BRAND

Rock Bottom Price.

"The PC Brand 386/SX-16 performed at least as well as the far costlier Compaq... We simply began marveling at what is surely the best bargain in personal computing."

-Computer Buyer's Guide, 386SX-16 Product Review

386/SX-16 Non Cache and 386/SX-20 Cache ISA Systems

386/SX-16 Non Cache and 386/SX-20 Cache Base Systems

Customize with the Video and Hard Drive options of your choice

- True 386™ SX™ Processor operating at 16MHz or 20 MHz with Zero Wait States
- Landmark Speed 18.3MHz (386/SX-16 Non-Cache), 28.9MHz (386/SX-20 Cache)
- Norton SI 18.7 (386/SX-16), 23.4 (386/SX-20)
- 512K RAM (expandable to 8MB)
- 16K CPU RAM Cache (SX-20 only)
- 1.2 MB or 1.44 MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

SX-16 \$799

SX-20 \$899

386/SX-16 Non Cache and 386/SX-20 Cache Super VGA Packages

This preconfigured package includes all the features of our base system with:

- 2MB RAM (expandable to 8MB)
- 40 MB/25Ms Hard Drive
- 14" Super VGA (1024 x 768 Resolution) Color Monitor
- 16 Bit High Performance Super VGA Card with 1MB Video RAM
- Dual 1.2 MB and 1.44 MB Floppy Drives
- High Resolution Mouse

SX-16 \$1,874

SX-20 \$1,974

All Systems also include: Free On-Site Service by TRW¹, Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features

- True 386™ SX™ Processor operating at 16 MHz or 20 MHz with Zero Wait States
- 512K RAM expandable to 8MB on System Board
- 16K CPU RAM Cache (SX-20 only) with Posted Write and Writeback Logic
- 1:1 Interleaved Hard/Floppy Drive Controller with 1MB/second disk transfer rate
- High Capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery

Standard Features Cont.

- 1 Parallel and 2 Serial Ports
- 387™ SX™ CoProcessor Support
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, NOVELL, 3COM, and PCNET compatibility
- 8 Slot Motherboard Design (5 16bit and 3 8bit)
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options

- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640x480)
- Super VGA Color (1024x768)

1-800-PC BRAND

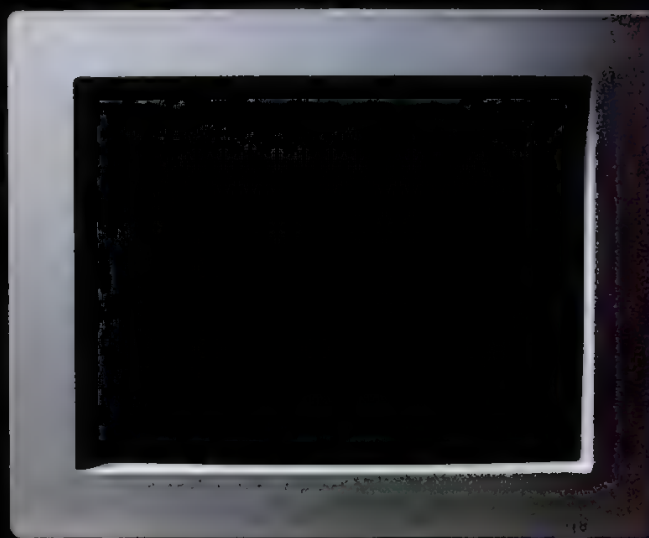
TEL 1-800-722-7263 FAX 1-800-722-7392

PC Brand, Inc. 954 W Washington St., Chicago, IL 60607
International Fax #312 633 2888 International Voice #312 226 5200
We are open Mon. thru Fri. 7am to 7pm, Saturday 8am to 4pm Central Time.
MasterCard, VISA, Discover, PC Brand Direct Advantage MasterCard, Checks
& Approved P.O.s Accepted Prices & specifications subject to change

¹TRW National Computer Maintenance Services Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details.

386, SX, 387, 486 are Trademarks of Intel Corporation

Rock Solid Service,



Now
386's
From
\$999



PC BRAND

Rock Bottom Price.

"The Best Low Cost Alternative Around"

-PC Magazine, 386/25 product review

386/25MHz ISA Systems

386/25 Base System

Customize with the Video and Hard Drive options of your choice

- True 25MHz Intel 80386 operating with Zero Wait States
- Landmark Speed 33.6MHz
- Norton SI 28.2
- 1MB Ram (expandable to 16MB)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz **\$999**

386/25 Super VGA Package

This preconfigured package includes all the features of our base system with:

- 4MB Ram (expandable to 16MB)
- 80MB/19MS Hard Drive
- 14" Super VGA (1024 x 768 Resolution) Color Monitor
- 16 Bit High Performance Super VGA Card with 1MB Video RAM
- Dual 1.2MB and 1.44 Floppy Drives
- High Resolution Mouse

25MHz **\$2,333**

All Systems also Include: Free On-Site Service by TRW[®], Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features

- True 25MHz Intel 80386 CPU Operating with Zero Wait States
- 1MB RAM expandable to 16MB on the System Board
- 1:1 Interleaving Hard / Floppy Drive Controller, w/ 1MB/second disk transfer rate
- 1 parallel and 2 serial ports
- High Capacity 200Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery
- 387[™] or Weitek Co-Processor Support

Standard Features Cont.

- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, UNIX, NOVELL, 3COM and PCNET compatibility
- 8 Slot motherboard design (5 16Bit & 3 8Bit)
- Medium Foot Print Desk Top Case with 6 Disk Drive Bays

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options

- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640x480)
- Super VGA Color (1024x768)

1-800-PC BRAND

TEL 1-800-722-7263 FAX 1-800-722-7392

PC Brand, Inc. 954 W. Washington St., Chicago, IL 60607
International Fax #312 633 2888 International Voice #312 226-5200.
We are open Mon. thru Fri.: 7am to 7pm, Saturday 8am to 4pm Central Time
MasterCard, VISA, Discover, PC Brand Direct Advantage MasterCard, Checks
& Approved P.O.s Accepted. Prices & specifications subject to change.

¹TRW National Computer Maintenance Services-Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details.

386, SX, 387, and 486 are Trademarks of Intel Corporation

Rock Solid Support,

**New
Lower
Prices
On
386 Cache
Systems!**



PC BRAND

Rock Bottom Price.



"...Flawless Compatibility, Lowest Price."

-InfoWorld, 386/33 Product Review

386/25MHz and 386/33MHz Cached ISA Systems

386/25 and 33 Cache Base Systems

Customize with the Video and Hard Drive options of your choice

- True 25MHz or 33MHz Intel 80386 CPU operating with Zero Wait States
- Landmark Speed 43.5MHz (386/25Cache), 58.7MHz (386/33Cache)
- Norton SI 31.6 (386/25Cache), 45.9 (386/33Cache)
- 1MB RAM (expandable to 16MB)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz **\$1,199**

33MHz **\$1,399**

386/25 and 33 Cache Super VGA Packages

This preconfigured package includes all the features of our base system with:

- 4MB RAM (expandable to 16MB)
- 125MB/19MS Hard Drive
- 14" Super VGA (1024 x 768 Resolution) Color Monitor
- 16 Bit High Performance Super VGA Card with 1MB Video RAM
- Dual 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz **\$2,654**

33MHz **\$2,854**

All Systems also include: Free On-Site Service by TRW¹, Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 60-Day* No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features

- True 25MHz or 33MHz Intel 80386 CPU operating at Zero Wait States
- Direct Map Cache Processor with 64K static RAM standard
- 1MB RAM expandable to 16MB on the System Board
- 1:1 Interleaving Hard/Floppy Drive controller, with 1MB/second disk transfer rate
- 1 Parallel and 2 Serial Ports
- 387² or Waitek Coprocessor Support

Standard Features Cont.

- High capacity 200 watt System Power Supply
- RealTime Clock/Calendar with 5 Year Battery
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, UNIX, NOVELL, 3COM and PCNET compatibility
- 8 slot Motherboard design
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options

- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640x480)
- Super VGA Color (1024x768)

1-800-PC BRAND

TEL 1-800-722-7263 FAX 1-800-722-7392

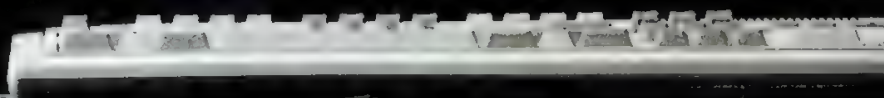
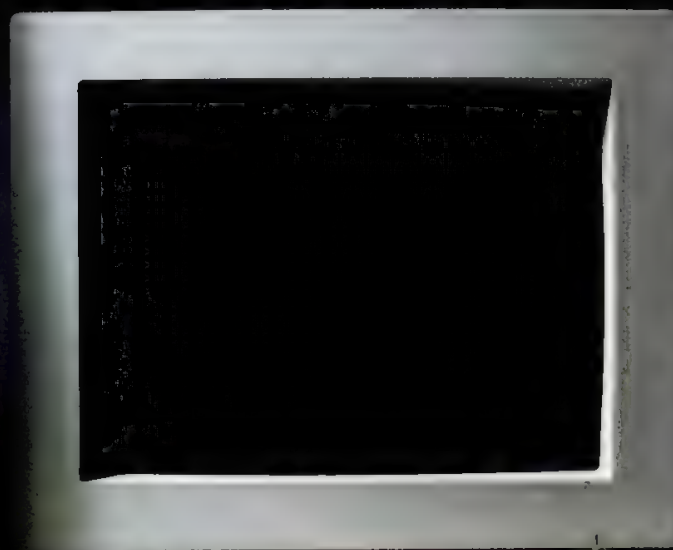
PC Brand, Inc. 954 W. Washington St., Chicago, IL 60607
International Fax #312 633 2888 International Voice #312 226 5200
We are open Mon. thru Fri. 7am to 7pm, Saturday 8am to 4pm Central Time
MasterCard, VISA, Discover, PC Brand Direct Advantage MasterCard, Checks
& Approved P.O.s Accepted Prices & specifications subject to change

¹TRW-National Computer Maintenance Services-Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details.

*60-day return for 386/33 InfoWorld Recommended System

386, 387, SX, and 486 are Trademarks of Intel Corporation

Rock Solid Performance,



PC BRAND

486's Now Under \$2,000.

"PC Brand is the L.L. Bean of Personal Computer Mail Order...PC Brand wants no unhappy customers... It's service and support policies help to insure that."

-Personal Computing, 10 Best Mail Order Companies

486/25MHz and 486/33MHz Cached ISA Systems

486/25 and 33 Base Systems

Customize with the Video and Hard Drive options of your choice

- True 25MHz or 33MHz Intel 80486 CPU operating at Zero Wait States
- Landmark speed 114.1MHz (486/25), 150MHz (486/33)
- Norton SI 41.5 (486/25) 51.5 (486/33)
- 1MB RAM (expandable to 32MB)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz **\$1,949**

33MHz **\$3,399**

486/25 and 33 Super VGA Packages

This preconfigured package includes all the features of our base system plus:

- 4MB RAM (expandable to 32MB)
- 125MB/19Ms Hard Drive
- 14" Super VGA (1024 x 768 Resolution) Color Monitor
- 16 Bit High Performance Super VGA Card with 1MB Video RAM
- Dual 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz **\$3,404**

33MHz **\$4,924**

All Systems also include: Free On-Site Service by TRW¹, Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features

- True 25MHz or 33MHz Intel 80486 CPU operating at Zero Wait States
- 1MB RAM expandable to 32MB
- Built-in 8K 4-Way Set Associative Cache
- Built-in Intel 487 Numeric Coprocessor
- Optional 128K or 256K auxiliary CPU Cache Card
- Optional Weitek Card
- 1:1 Interleaved Hard/Floppy Drive Controller with 1MB/second disk transfer rates
- 1 Parallel and 2 serial Ports
- High capacity 200 watt System Power Supply

Standard Features Cont.

- Real Time Clock /Calendar with 5-year Battery
- 7 Slot Motherboard Design with one 32bit proprietary Zero Wait State Slot
- Industry Standard BIOS with MS/DOS, OS/2, XENIX, UNIX, NOVELL, and 3COM and PCNET compatibility
- Medium footprint desktop case with 6 disk drive bays

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options

- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options

- Mono Graphics
- VGA Mono
- Color VGA (640 x 480)
- Super VGA Color (1024 x 768)

1-800-PC BRAND

TEL 1-800-722-7263 FAX 1-800-722-7392

PC Brand, Inc. 954 W. Washington St., Chicago, IL 60607
International Fax #312 633-2888 International Voice #312 226-5200.
We are open Mon. thru Fri.: 7am to 7pm, Saturday 8am to 4pm Central Time
MasterCard, VISA, Discover, PC Brand Direct Advantage MasterCard, Checks & Approved P.O.s Accepted. Prices & specifications subject to change

¹TRW-National Computer Maintenance Services-Free on site service for 386/SX, 386/DX, and 486's for customers located within a 100 mile radius of any of over 200 TRW service centers. On site service for 286's available at extra cost. Call for details



Rock Solid Quality

At PC Brand our mission is simple: to provide you with computer systems to your exact specifications; constructed with only top quality components from the industry's leading manufacturers; at an outstanding price. The Best in the Business.

PC Magazine said it best in a recent review: "...PC Brand machines are an efficient combination of in-house engineering and top-notch off the shelf parts..."

Infoworld obviously agrees awarding their highest honor 'Recommended Product' with its quality seal of approval, to our 386/33 Cache Product.

Rock Solid Warranty.

The Best way we can stand behind our pledge to quality is to support it with the longest standing warranty in the Business. 5 Years.

Rock Solid Support.

The need for support installing specialized software, add-on peripherals, LAN's and the like is not a matter of *IF* you need it, but *WHEN*. Our job is to be there, when you need us, just a telephone call away to pitch-in and get your problem solved. That is our challenge and our commitment backed by the skills and service of some of the best technicians in the business, at your service through our unlimited Toll-Free Techline program. The Best in the Business.

Rock Solid Service.

In addition to our unlimited Toll-Free Techline, If your system requires a repair there's no need to send it back or carry it in, we'll come out to your site and fix it Free-of-Charge for any 386/SX, DX or 486 Computer.

Rock Bottom Price.

With PC Brand you deal direct. No middleman, no dealers, no distributors: no 'partners in profit' to boost up the price and give you nothing in return.

At PC Brand we take their share of the profit and give it directly to you in a lower system price and in better service and support. The Best in the Business.

This formula works! And it's why more experienced PC buyers are leaving the retail channel behind and joining the ranks of tens of thousands of Satisfied PC Brand Clients. Working with the Best in the Business.

PC BRAND

Finally, a computer company that specializes in satisfied customers.

CIRCLE 303 ON READER SERVICE CARD

PCM 91-4

IBM PS/2 Models 90 and 95 **True 486 Power At Last**

Long after its competitors have brought out 486 machines, IBM has finally delivered a pair of PS/2s with true 486 power. The new PS/2s promise to give Compaq and other high-performance contenders a run for the money.

by Winn L. Rosch

They're late to the party perhaps, but the arrival of IBM's Personal System/2 Models 90 and 95 XP486 hints that the real fun is just beginning. Finally, there's tough competition at the high-performance end of the PC market. These fraternal twins are IBM's first true 486-based PCs, and they are powerful enough to challenge any machine on the market.

As far as performance is concerned, the twins break new ground only for IBM. At best, they only achieve parity with the processor performance of Compaq's trendsetting Systempro, which won *PC Magazine's* 1990 Award for Technical Excellence for desktop PCs. While their test results put the Models 90 and 95 in good company—among the fastest computers *PC Magazine Labs* has ever tested—trailing the leader by a year hardly rates as a remarkable accomplishment.



The real importance of the PS/2s runs deeper. These are showcase machines that demonstrate new technologies and new directions for IBM's PC program. They just may be the catalysts that help put IBM back into a leadership role.

The Models 90 and 95 show off several technologies and attempt to set new industry standards. Bus mastering, heretofore a promise made but not kept by the Micro Channel architecture, is delivered in force. The long-awaited next step in high-resolution display systems—the 1,024-by-768 Extended Graphics Array, or XGA—is standard equipment in both new systems.

Many mysterious changes in system design mark radical departures from IBM's previous practices. Case construction is unlike that of any previous PS/2. The system boards of the new machines lack microprocessors. Even the 5.25-inch floppy disk drive is back. (See the sidebar "IBM's Slim High Drive: New Tricks for an Old Form Factor.") If the Models 90 and 95 foretell the future of the IBM product line accurately, it is a future we had not expected.

PLOP AND SWAP

More than any previous IBM PC, the Models 90 and 95 are machines designed to be upgraded. Not only can you plop in new peripherals, you can upgrade both the microprocessor and the entire control system of the Micro Channel expansion bus simply by swapping an expansion board. You don't even need tools to make the change.

If you're a prospective purchaser, that's the good news. When technology changes, the Models 90 and 95 can adapt while preserving much of your admittedly steep investment. But if you're competing with IBM in the PC market, the new designs are bad news indeed. The new PS/2s can serve as the foundations for PCs with much higher performance. The cases and system boards of the Models 90 and 95 could be the building blocks that allow IBM to offer the first 50-MHz 486s and the first 586 PCs on the market.

Such quick upgrades are a definite possibility. Already IBM has shown the willingness and the ability to bring new power to the marketplace. For example, the PS/2 Model P75 introduced at Fall Comdex 1990 was the first 486-based portable PC to earn the FCC Class B approval needed to be legally sold in the U.S. (See the sidebar "IBM's P75 Puts a



FACT FILE

IBM Personal System/2 Model 90 XP 486
IBM Corp.; contact local dealer or 800-426-2468.

List Price: Model 90 XP 486-OJ5, with 4MB RAM, 80MB hard disk, 8K caching controller, 1.44MB floppy disk drive, one parallel and two serial ports, mouse port, 80486/25 processor, 101-key keyboard, \$12,495. Model 90 XP 486-OJ9, with 160MB hard disk, \$13,095. Model 90 XP 486-OKD, with 320MB hard disk, 80486/33 processor, \$16,695. IBM PS/2 Color Display 8515, \$950.

In Short: This is IBM's first true 486 desktop system. Using a design akin to passive backplaning, it puts the CPU and other circuitry on a Processor Complex board, so you can choose between a 25-MHz and a 33-MHz chip now and migrate to more-powerful processors in the future. XGA, IBM's new high-resolution graphics spec, is built into the system board.

CIRCLE 406 ON READER SERVICE CARD

IBM Personal System/2 Model 95 XP 486
IBM Corp.; contact local dealer or 800-426-2468.

List Price: Model 95 XP 486-OJ9, with 4MB RAM, 160MB hard disk, 8K caching controller, 1.44MB floppy disk drive, one parallel and one serial port, mouse port, 80486/25 processor, 101-key keyboard, \$14,145. Model 95 XP 486-OJD, with 320MB hard disk, \$16,095. Model 95 XP 486-OKD, with 320MB hard disk, 80486/33 processor, \$17,745. IBM PS/2 Color Display 8515, \$950.

In Short: One of the fastest machines that ever dashed through PC Labs, the Model 95 (with its 33-MHz 486 Processor Complex board) is as powerful as the Compaq Systempro. This network server employs the same design as the Model 90. XGA resides on an expansion board called the XGA Display Adapter/A rather than on the system board.

CIRCLE 406 ON READER SERVICE CARD.

Handle on 486 Power.") The Models 90 and 95 give IBM the potential for making similar strides in desktop hardware. Although latecomers to the high-performance party, the twins may be able to bring back the excitement that's been missing for such a long time.

CHOOSE YOUR CONFIGURATION

IBM introduced the Models 90 and 95 on October 30, 1990. Twins only in processor power and function, they offer similar features but are packed in different cases and built around different electronics. The Model 90 is a desktop chassis in the tradition of the PS/2 Models 50, 55, and 70. The Model 95 is a desktower à la the Models 60, 65, and 80. IBM offers three configurations of each model, for a total

of six different units, differentiated by processor speed and the size of the standard hard disk.

The Model 90 XP 486-OJ5 (also known as the 8590-OJ5) includes a 25-MHz chip and 17-millisecond 80MB hard disk for—\$12,495. (Swallow hard; the prices only get higher.) Upgrading to a 16-ms. 160MB hard disk produces the Model 90 XP 486-OJ9 (or 8590-OJ9) and pushes the price to \$13,095. Moving up to a 33-MHz chip and increasing disk capacity to 320MB with a 12.5-ms. access time produces the Model 90 XP 486-OKD (or 8590-OKD), which lists for \$16,695.

The Model 95 configurations have a narrower range in price. At the bottom of the line is the Model 95 XP 486-OJ9 (8595-OJ9), which operates at 25 MHz with a 16-ms. 160MB SCSI hard disk and costs \$14,145. Substituting the 12.5-ms. 320MB hard disk changes the moniker to Model 95 XP 486-OJD (8595-OJD) and raises the list price to \$16,095. Choose a 33-MHz chip, and you've got the Model 95 XP 486-OKD (8595-OKD), with a list price of \$17,745.

IBM offers the \$1,060, 80MB hard disk and \$1,780, 160MB hard disk separately for system upgrades. For even more disk expansion, IBM also sells a floor-standing external chassis called the PS/2 External Enclosure that can hold up to 2.24GB of additional SCSI storage. Equipped with a single 320MB disk, this enclosure costs \$6,500. Core International has also announced a series of companion hard disk arrays with individual capacities up to 4 gigabytes. (See the sidebar "When You Need More Gigabytes: Drive Array Subsystems from Core.")

STANDARD EQUIPMENT

Each of these six new PS/2 models has a similar offering of standard features. Each one comes with 4MB of 70-nanosecond RAM factory-installed. The basic configuration can currently be expanded to a maximum of 32MB in each machine, and more when higher-capacity memory modules become available.

IBM does nothing to match microprocessor memory in the base-priced systems, relying instead on the 8K RAM cache that's part of the 486 chip. Any of the new PS/2s will also host an optional 256K RAM cache, priced at \$1,995—perhaps the most expensive memory in the world today, at \$8,000 per megabyte.

Expanding the ordinary system RAM of the new PS/2s isn't quite so costly but

is still substantially more expensive than adding generic memory. IBM lists 2MB modules for \$565 and 4MB modules for \$1,095. On the other hand, those prices are somewhat more modest than what Compaq demands for its Systempro's memory (\$799 for 2MB modules, \$1,599 for 4MB modules).

IBM does not provide a socket for a Weitek 4167 coprocessor on either machine. But that's okay, because Intel's 486 chip has its own built-in numeric coprocessor.

Each of the new systems comes with a 1.44MB 3.5-inch floppy disk drive. A second floppy disk drive can be added, either another 1.44MB model for \$263 or—surprise—an internal 1.2MB 5.25-inch model. The latter, which IBM calls a Slim High drive, lists for \$310. (See the sidebar "IBM's Slim High Drive: New Tricks For an Old Form Factor.") IBM also sells an external 5.25-inch floppy disk drive for the desktop Model 90 (both 360K and 1.2MB units are available). These are entirely new floppy disk drives; external IBM drives designed for earlier PS/2 machines will not work with the Model 90.

NEW GRAPHICS: XGA

IBM's new XGA capabilities come standard with both the Models 90 and 95. (For more on XGA, see the article "Boosting Video Performance under Windows 3.0," in this issue.) In the Model 90, the XGA circuitry is built into the system board. In the 95, it is delivered in the form of an expansion board, IBM's XGA Display Adapter/A. This board, which uses a 32-bit Micro Channel bus connector, can be purchased separately for \$1,095 should you want to upgrade your existing Micro Channel computer. The price of the board is included in the cost of the Model 95, which IBM does not sell without the adapter.

The XGA output of the new PS/2s will work with all existing VGA monitors, monochrome and color. As with VGA systems, the XGA circuitry detects what sort of monitor is connected and adjusts itself accordingly. But to get the full 1,024-by-768 resolution of the nascent XGA standard, you'll need a monitor that's compatible with the scanning frequencies of IBM's interlaced 8514/A adapter (35.5 kHz horizontal, with an 88-Hz field rate and 44-Hz frame rate). In the IBM product line, the recommended monitor is the \$950 Color Display 8515.

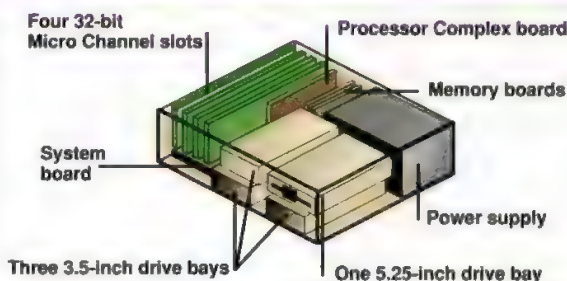
UNDER THE HOODS OF THE NEW PS/2s

by Winn L. Rosch

IBM's new pair of PS/2 computers share some essential features. Both machines are available with either 25-MHz or 33-MHz 486 CPUs. They both come with IBM's new XGA video capabilities and the IBM SCSI 32-bit bus-mastering adapter. The two

IBMs share the same Processor Complex, an expansion board that houses the CPU and allow users to make easy upgrades. But being designed for two completely different markets, the two Big Blue machines are like fraternal rather than identical twins.

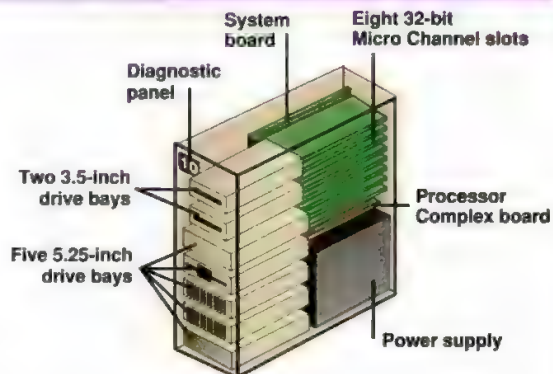
IBM Personal System/2 Model 90 XP 486



Geared toward the desktop market, the IBM PS/2 Model 90 provides four Micro Channel slots, only one of which is occupied—by the SCSI host adapter. The Model 90 also has two proprietary memory boards. XGA resides on the system board.

IBM Personal System/2 Model 95 XP 486

Designed for network server applications, the IBM PS/2 Model 95 tower offers seven drive bays, eight Micro Channel slots, and even room for AT-size expansion boards. One of the 32-bit slots is occupied by the SCSI adapter, while another holds the XGA adapter. The system board has eight SIMM sockets and no proprietary memory boards.



Both the Models 90 and 95 use the Micro Channel architecture for expansion. After the standard-equipment bus-mastering 32-bit SCSI host adapter is installed to control the hard disk, the desktop Model 90s can hold three expansion boards. Once the SCSI adapter and the XGA board are in place in the tower Model 95s, they each can hold six boards. All slots in both machines offer the full 32-bit data path.

The Model 90 comes equipped with one parallel and two serial ports. The Model 95 offers one of each. Both ma-

chines also include mouse and keyboard ports that use miniature DIN connectors (PS/2 style).

The input/output ports in the Models 90 and 95 are substantially different from those of other PCs in that they use direct memory access (DMA) control. Coupled with the Micro Channel's bus mastering, a DMA printer port can cut the CPU overhead required in printing. In serial ports, DMA operation allows higher data rates. For example, the serial ports in the Models 90 and 95 are rated at up to 345,600 bits per second. In previous IBM models,

supported serial port speeds topped out at 19,200 bps.

PASSIVE BACKPLANE

There's very little on the system boards of the new PS/2s—just the DMA printer and serial ports, video (in the case of the Model 90), and the system clock. IBM has moved the CPU, its support circuitry, and even the Micro Channel bus control logic to a special expansion board called the Processor Complex, which fits into a dedicated proprietary expansion slot. This option makes the Models 90 and 95 awfully close to passive-backplane computers—a big switch from IBM's practice of making single-board PCs with all the brains on the system board.

Although it's radical for IBM, passive backplaning is not a new idea. Back in 1981, the Z80-based CP/M microcomputers (the most powerful at that time) were based on S-100 architecture, which utilized a passive-backplane design. Instead of a system board, these machines were made from several expansion connectors linked together with printed circuit traces on a circuit board. Nothing fancy here—the traces were just like ordinary wire. The main board was the backplane (which was installed flat in the back or bottom of the computer). And it was called passive because it lacked any active semiconductor circuitry.

The first IBM PC sent the fledgling micro industry in a new design direction, toward the single-board computer. The PC's intelligence—its microprocessor and support circuitry—was built onto the system board that lined the chassis. Expansion slots were provided for enhancing the machine's capabilities, but a PC would operate even without boards in the slots. (If you wanted to be able to see what you were doing, you needed a display board of some kind, but IBM even integrated display systems in its first PS/2 designs.) While some manufacturers have toyed with the passive-backplane design in PCs—NCR and Zenith are included in this list—their backplaned computers have drifted far from the mainstream.

The Models 90 and 95 are not truly passive-backplane systems. A full-fledged passive-backplane design would put all of the system's guts on a single card that plugs right into any expansion slot. But the PS/2's Processor Complex design embodies the most important element of passive backplaning: All the circuitry that determines the power and compatibility

of the new PS/2s is relegated to a plug-in board. The only functions left on the system board are the time-of-day clock, the floppy disk controller, the display circuitry, and the I/O ports. Ironically, these are the very same features that the original PC left to expansion boards. The obvious advantage of the new PS/2 design is that you can upgrade easily as faster chips, such as the forthcoming 50-MHz chip, become available.

On the surface, the Processor Complex

may sound similar to the Model 70's Power Platform, a small board with a chip and support circuitry on it. By plugging a new Power Platform into the Model 70, you can upgrade from a 25-MHz 386 to a 25-MHz 486. (Now that IBM has two real 486s, the company has slashed the price of the Power Platform from \$3,995 to \$1,900.) But as an upgrade path, the Power Platform has limitations; it can't change the CPU's speed or other capabilities.

Likewise, the Processor Complex's design may sound like designs from other manufacturers such as ALR, AST, and

IBM'S SLIM HIGH DRIVE: New Tricks for an Old Form Factor

by Winn E. Rosch

One innovation introduced along with the IBM PS/2 Models 90 and 95 appears to be something of an anachronism: a 5.25-inch internal floppy disk drive called the Slim High. And you thought that old floppy disk form factor had gone the way of the dinosaur! IBM's explanation for this seemingly backward step is that the \$310 drive takes advantage of the new PS/2s' 5.25-inch bays, which are slated for technologies far more important than floppies: CD-ROM players and rewritable magneto-optical disk drives.

The new 5.25-inch drive is a perfect swan song for that format. Measuring about one-third the height of a full 5.25-inch bay (hence the "Slim High" moniker), the new drive is perhaps the most technically sophisticated floppy disk drive ever created. Instead of twisting an arm or closing a door to latch in a disk, you need only slide a floppy disk into the waiting slot. A servomechanism clamps the disk in place and presses the read/write heads against it. To eject the disk, simply press a button and the mechanism will unload the heads and pop the disk out the slot. According to IBM, one of the driving forces behind this sophisticated design

**Just when you
thought it was safe
to switch to the 3.5-
inch format, IBM
brings out a new
5.25-inch internal
floppy disk drive
called the
Slim High.**

was to aid people with special needs who might not be able to operate a conventional floppy disk mechanism.

Although the new Slim High drive has all the technical specifications of a conventional high-density floppy disk drive—1.2MB formatted capacity per disk across 80 tracks, 500-kilobit-per-second data transfer rate—it uses the PS/2 3.5-inch disk drive connector scheme. Ordinary floppy disk drives won't plug into the cables inside the new PS/2s.

To accommodate the Slim High drive, the new PS/2s use a variation on IBM's 3.5-inch drive mounting scheme. The Slim High mounts on a sled that slides into a bay and snaps into place. Although wider than the sleds used by 3.5-inch drives, the 5.25-inch sleds are mechanically similar. In fact, the 5.25-inch bay of the Model 90 is fabricated with two sets of guides, one set that accommodates a 5.25-inch sled and one that accommodates a 3.5-inch sled.

As with 3.5-inch PS/2 floppy disk drives, the decorative front panel of the Slim High is separate from the drive itself. It snaps into place as part of the system unit fascia. ■



WHY THE BEST MOUSE FOR THE MAC IS YOUR BEST CHOICE FOR WINDOWS:

In the graphical environment of the Macintosh® our Turbo Mouse® is number 1 in both sales and awards. That's why your choice for the graphical environment of Windows should be our PC version: Expert Mouse™.

What makes Expert Mouse outshine the rest? Superior optical hardware and unique software are the difference.



One button lets you pull down a menu or open a window. The other button can be set to "click-lock" for extended selections like automatic scrolling.

Press both buttons together and you activate our special "chording" feature. Chording gives you advanced features, like three-button emulation, without the inconvenience of lifting your hand off the ball.

What's more, our Custom Control Panel lets you adjust both acceleration and double-click speed to match the way you work. It even lets you decide which button performs what function.

Best of all is the way Expert Mouse feels — solid and comfortable, with an easy ball movement that means no jumping or sticking.

And Expert Mouse is 100% Microsoft compatible. So you will be able to run all your favorite Windows applications.

Windows can make your computer a lot easier to use. Now, the Kensington Expert Mouse will make it even easier.

For a free brochure and the dealer nearest you, call 800-535-4242. Outside the U.S. 212-475-5200.



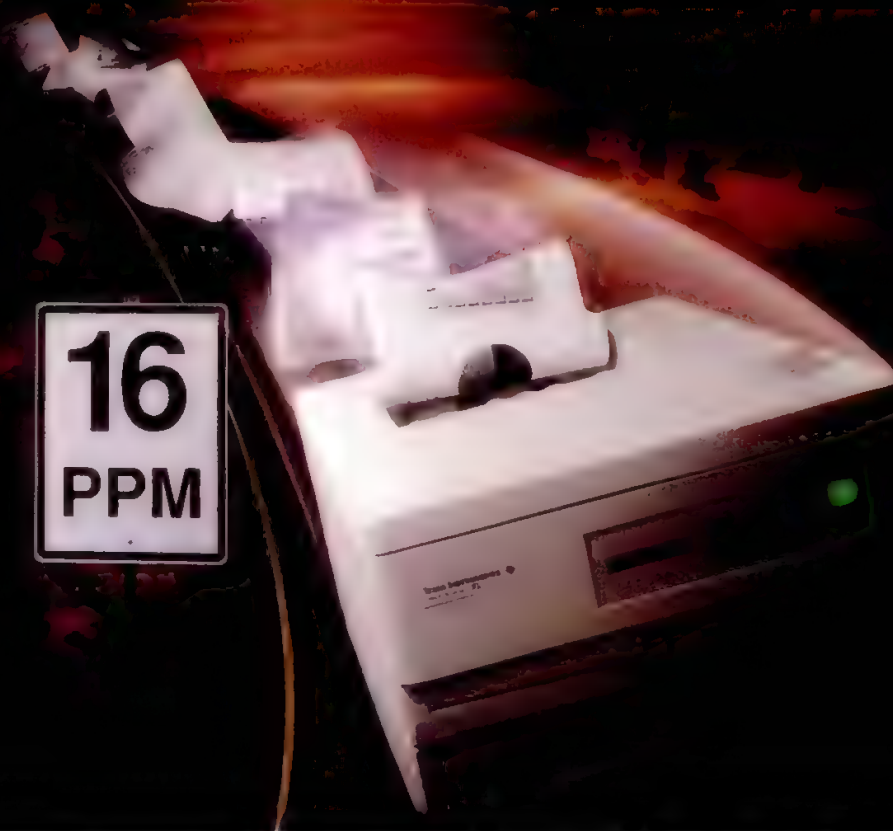
KENSINGTON.

CIRCLE 220 ON READER SERVICE CARD

Expert Mouse is a trademark and Kensington and Turbo Mouse are registered trademarks of Kensington Microware Limited. Microsoft and Windows are registered trademarks of Microsoft Corporation. Macintosh is a registered trademark of Apple Computer Inc. © 1990 Kensington Microware Limited.

8
PPM

16
PPM



Never before has such a small laser printer offered so much speed and economy — and Adobe® PostScript®, too.

Introducing the 16 ppm microLaser™ XL printer. It's fast, flexible and affordable. Now you can afford a 16 ppm laser printer at an 8 ppm price. The newest addition to Texas Instruments award-winning microLaser family starts at just \$3,449* for the standard model. Or choose from two affordable Adobe PostScript models**, with either 17 or 35 fonts.

For one or many users.

Whether you use Macintosh®‡, IBM® or UNIX® computers — or a combination — microLaser XL can handle the workload for you or your whole department. You can even switch between HP LaserJet® II emulation and PostScript without turning off the printer. At only 15.8" wide and 16.6" deep, microLaser XL is the smallest laser printer in its class. So it's easier to find room for this type of power.

Superior paper handling.

Save time loading paper — microLaser XL's paper drawer holds 250 sheets. You'll save



space too, because the drawer slides conveniently inside the printer. An optional, second 500-sheet paper feeder (750 sheets total) and automatic feeder for 70 envelopes are available for your large print jobs and mail-merge applications.

Easy, no-tools upgrade to PostScript. Choose the standard microLaser XL and

add the powerful font and graphics capabilities of PostScript software at any time. Because microLaser XL uses the same modular controller board design as the original microLaser, upgrading is easy and affordable — no tools or service calls needed.

See the power and performance of microLaser XL for yourself. Call for the location of a dealer near you.

1-800-527-3500

*TI suggested list price.
**\$3,999, 17 fonts; \$4,499, 35 fonts — TI suggested list prices.
‡Requires PostScript, 1.5MB memory and an optional AppleTalk® interface board.

CIRCLE 750 ON READER SERVICE CARD

microLaser is a trademark of Texas Instruments Incorporated. Adobe, PostScript and the PostScript logo are registered trademarks of Adobe Systems, Inc. Macintosh and AppleTalk are registered trademarks of Apple Computer, Inc. IBM is a registered trademark of International Business Machines Corporation. UNIX is a registered trademark of AT&T. LaserJet is a registered trademark of Hewlett-Packard, Inc. ©1991 TI 66084


**TEXAS
INSTRUMENTS**



BENCHMARK TESTS: IBM PS/2 486s

When it comes to raw speed, IBM's new PS/2 Model 95 XP 486 and Compaq's Systempro are pretty evenly matched. Both rank among the fastest machines ever to dash through PC Labs.

PROCESSOR AND MEMORY BENCHMARK TESTS

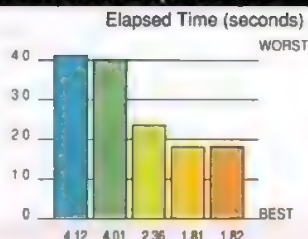
80386 Instruction Mix

The 80386 Instruction Mix benchmark test times a series of tasks specific to the 80386 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.



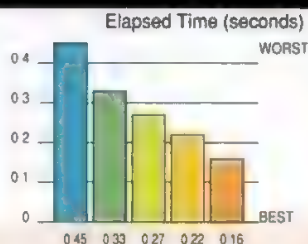
Floating-Point Calculation Without Coprocessor

The Floating-Point Calculation Without Coprocessor benchmark test sets up a floating-point emulation program in RAM and then exercises the processor and tests RAM access speeds during floating-point calculations.



Conventional Memory

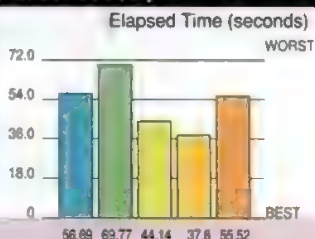
The Conventional Memory benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.



* Reported for comparison

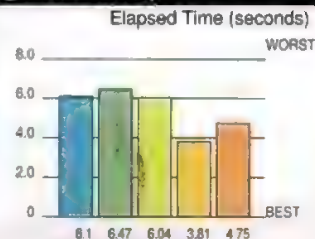
DOS File Access (Small Records)

The DOS File Access (Small Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. The test is performed without software disk caching. Fast times are advantageous for programs that work with many short segments of data.



DOS File Access (Large Records)

The DOS File Access (Large Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. This test minimizes the effect of small hardware caches on disk subsystem performance. It is performed without software disk caching. Fast times are better when large files are loaded.



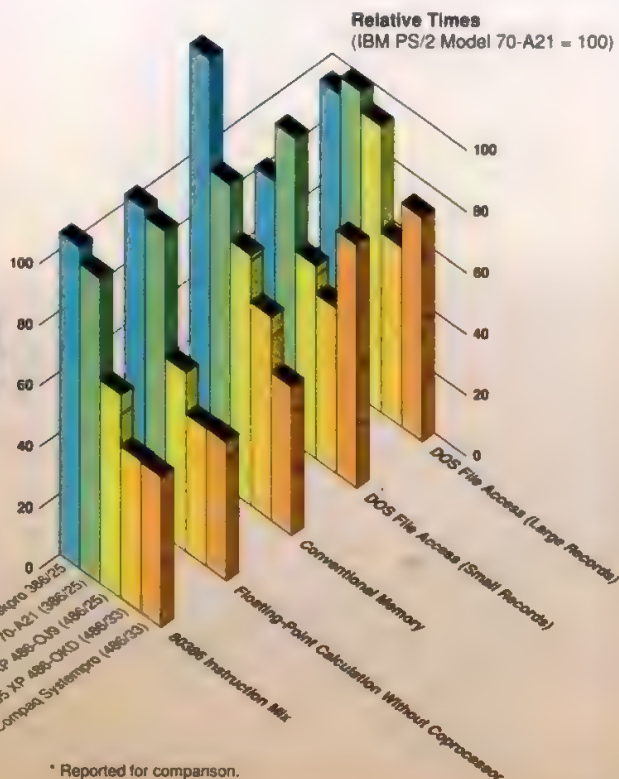
DISK BENCHMARK TESTS

PROCESSOR, MEMORY, AND DISK BENCHMARK TESTS: COMPOSITE VIEW

The IBM Personal System/2 Model 95 XP 486 and the Compaq Systempro are two of the fastest systems ever tested at PC Magazine Labs. With 33-MHz 486 processor boards installed, the two delivered comparable performance on our 80386 Instruction Mix and Floating-Point Calculation benchmark tests. The desktop IBM Personal System/2 Model 90 XP 486, which had only a 25-MHz 486 installed, naturally lagged slightly behind. All three 486s executed our processor tests significantly faster than such 25-MHz 386 machines as the IBM PS/2 Model 70-A21 and Compaq Deskpro 386/25.

On our Conventional Memory test, however, the Systempro—with its 512K of external processor RAM cache (PRC)—is the clear winner. Although such a cache does not come standard with the PS/2 Model 90 or 95, the configurations we tested both had a 256K external PRC board installed.

On our DOS File Access tests, the Model 95 performed better than the Systempro. IBM's advantage under DOS stems from the SCSI controller. The controller has 512K of disk cache RAM, which helps move the data from the 32-bit-wide Micro Channel bus to the 8-bit-wide SCSI bus. No numbers are reported for the BIOS Disk Seek test, which does not produce meaningful results when run on a SCSI controller.



* Reported for comparison.

CONTINUES

Our 8ppm printer
earned the Okidata OK!TM
by offering you something
the LaserJet III doesn't.



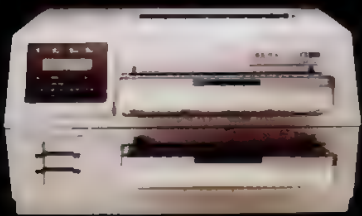
The OL800: 8ppm page printer \$1499



The OL820: W/built-in font scaling \$1999



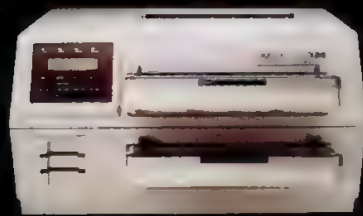
The OL840: W/PostScript \$2999



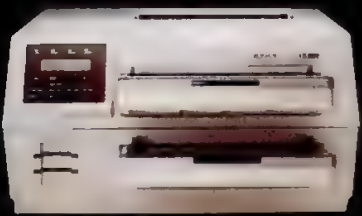
The OL800: W/200 sheet 2nd paper tray



The OL820: W/200 sheet 2nd paper tray



The OL840: W/200 sheet 2nd paper tray



The OL800: W/multi-user port (3 add'l users)*



The OL820: W/multi-user port (3 add'l users)*



The OL840: AppleTalk Network Ready

Freedom of choice.

Your best choice in an 8 ppm page printer is the one that gives you the most to choose from: the Okidata OL800 Series.

With Okidata, you're free to choose the features you need, free to save money by eliminating features you *don't* need, and even free to change your mind later.

The OL800: No Frills, But All The Options.

For only \$1499** list, the Okidata OL800 gives you a full-featured 8 ppm printer: 26 fonts, 4 typefaces, HP Series® II compatibility, both serial and parallel interfaces, and the industry's only 5-year warranty—on Okidata's unique LED printhead.

As your needs grow, you can easily add options that are *no* option with the LaserJet® III—a second paper tray for more flexible paper handling, or a network port that automatically accepts output from three additional PCs in a workgroup. You can even upgrade your OL800 to match either of our high-performance printers described below.

The OL820: Faster Than A LaserJet III.

Besides having more resident scalable fonts than the LaserJet III (13 versus 8), the OL820 also has more brains. Thanks to a unique hardware chip designed by Okidata engineers, it instantly solves complex font scaling, type rotation and grayscaling problems "on the fly"—problems the LaserJet has to go back to its software to work out.

So the Okidata OL820 can deliver up to three pages of sophisticated text while

the LaserJet III is still thinking about printing its first page. In fact, InfoWorld magazine found the Okidata OL820 to be "the fastest office printer we've tested."

Second paper tray and 4-station workgroup options are available for your Okidata OL820 as well.

The OL840: PostScript From PC To Mac And Back.

If Adobe PostScript® printing is on your menu, the Okidata OL840 offers it for \$700 less than a comparably equipped HP. Yet that low list price includes 35 genuine Adobe PostScript fonts, plus 26 bitmapped fonts (4 typefaces); 2 megabytes of installed RAM; plus serial, parallel, and AppleTalk Network® interfaces. You can connect the OL840 to both PC and Macintosh® workstations, and switch between systems instantly.

And the OL840 still leaves you with plenty of options—a second paper tray, extra memory, and a wide selection of additional PostScript fonts on easy-to-install ROM cards.

Finally, every Okidata OL800 Series printer has earned the Okidata OK!—your personal promise from us that it will deliver not just good value, but exceptional value...will provide not just adequate performance, but outstanding performance.

If you're looking for an 8 ppm page printer, your best choice is the one that gives you freedom of choice—the Okidata OL800 Series. For additional information call 1 (800) 800-7333.



We don't just design it to work. We design it to work wonders.™

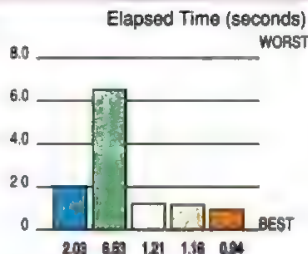
*Permanent selection of PC base. **Manufacturer's suggested retail price. Dealer price may vary. HP Series, LaserJet, Adobe PostScript, AppleTalk Network, Macintosh are trademarks of their respective companies. Okidata is a registered trademark of Okidata America Inc. Message displayed on Okidata America Inc. Okidata OK! is a trademark of Okidata America Inc. LTD. We don't just design it to work. We design it to work wonders.™ is a trademark of Okidata America Inc. InfoWorld 08/90.



BENCHMARK TESTS: IBM PS/2 486s

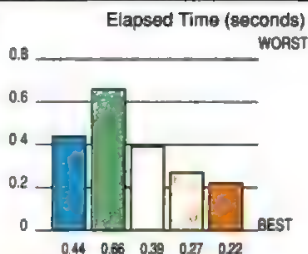
Direct to Screen

The **Direct to Screen** benchmark test indicates the speed of the video adapter memory. Good scores indicate that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen.



Video BIOS Routine Without Scrolling

The **Video BIOS Routine Without Scrolling** benchmark test measures how quickly the BIOS on the video adapter writes text data to the screen. Fast video writing helps with programs that show full or partial screens of data without scrolling the screen.



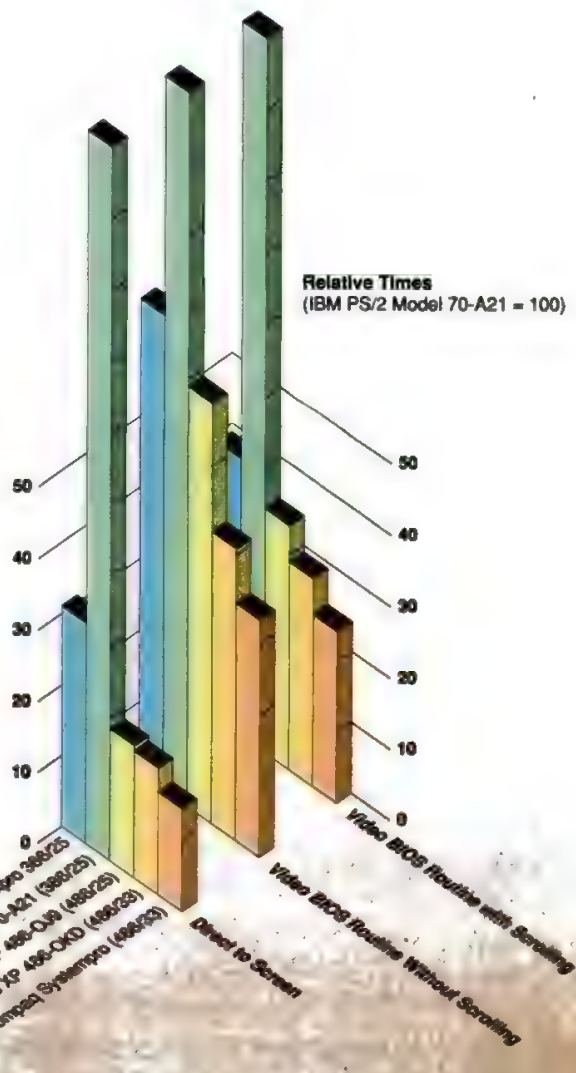
Video BIOS Routine with Scrolling

The **Video BIOS Routine with Scrolling** benchmark test measures how fast the video adapter can scroll the screen, moving the display up one line at a time. Good performance is helpful for scrolling through word processing or spreadsheet files.



* Reported for comparison.

PC Magazine Labs ran these tests with video and system shadowing enabled, if possible, and we left the buffers at their default values. We used no software disk caches when performing disk benchmark tests, and no RAM-resident programs were loaded for any tests. The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds, so take this into account when making purchasing decisions based primarily on speed.



* Reported for comparison.

ENDS



VIDEO BENCHMARK TESTS: COMPOSITE VIEW

IBM's new XGA video subsystem comes with the new PS/2s. XGA's VRAM doesn't perform as well as the Compaq Systempro's built-in VGA adapter on our Direct to Screen video test. While the IBM and Compaq systems employ some type of hardware assist for graphics manipulation, we did not have these features enabled during the tests.

PC Labs' tests confirm IBM's claim of register-level VGA compatibility. XGA also provides adapter interface compatibility with the IBM 8514 display adapter; moreover, it supports up to 1MB of VRAM and graphics coprocessing. Like the SCSI controller, XGA moves data across a 32-bit channel. And like the controller, it performs bus mastering.



**"We're ready
for a more
powerful SX.
I'm choosing
the Acer
1120/SX."**



When you are ready for a computer crafted entirely by a single corporate hand that delivers no-compromise 386SX performance, superior VGA graphics, and the power to run the software of today and tomorrow, you're ready for the Acer 1120/SX.

Loaded with the new Intel® i80386SX™ running at 20 MHz, it has standard 2 MB of fast system RAM expandable up to 8 MB (with an optional factory-installed 100-MB hard drive), integrated high quality VGA video, built-in parallel, serial, and mouse ports, a choice of either a 3.5" or 5.25" floppy disk, and a PS/2 mouse.

The surface mount design of the motherboard greatly increases the reliability

of the Acer 1120/SX, and results in a more compact footprint. With no switches to set, installation is easy. A password security feature protects your data, and you can choose from a full line of AcerView VGA monochrome and color monitors to complete your systems purchase.

Bundled with MS-DOS® 3.3, and MS-Windows® 3.0, the Acer 1120/SX also supports OS/2®, UNIX®, XENIX®, and NOVELL® NetWare and is backed by our rock-solid 2 year warranty.

Call 1-800-SEE-ACER for more information on the premium 20 MHz SX personal computer, the Acer 1120/SX.

One look and you, too, will agree that there's no compromise with the premium Acer 1120/SX.

Acer 

Your Global Partner in Computing

© 1991 Acer America Corporation.
Acer and the Acer logo are registered trademarks of Acer Inc. Altos is a registered trademark of Altos Computer Systems. All other product names are trademarks of their respective manufacturers.
CIRCLE 519 ON READER SERVICE CARD

Compaq. Although these designs let you increase the clock speed and upgrade the CPU, they don't allow any alterations of the system's basic bus-control logic. IBM goes further in its implementation of passive backplaning.

DRAMATIC UPGRADES

The real advantage of IBM's Processor Complex design is that a new board can bring more than boosted microprocessor performance. Because the bus-control logic for the new computers is on the

Processor Complex board, the entire control circuitry of the Micro Channel can be upgraded with a board swap. Whereas the first PS/2s were rendered technically obsolete when IBM altered the Micro Channel specification, the new PS/2s can change as bus standards are upgraded. With the Processor Complex, bus performance can be boosted to match chip upgrades.

Currently only one Processor Com-

plex upgrade is available: For \$2,500, you can upgrade to a 33-MHz machine. But bus changes are inevitable.

Neither of the new machines incorporates all the design innovations of the Micro Channel/2 announcement that coincided with the introduction of IBM's RISC-based workstation, the RS/6000. For example, the Models 90 and 95 do not support streaming data mode or multiplexed data transfers.

According to IBM, the maximum data throughput of the bus, when con-

WHEN YOU NEED MORE GIGABYTES: Drive Array Subsystems from Core

by M. Keith Thompson

As we went to press, Core International brought out some interesting alternatives to IBM's external tower of SCSI hard disk drives. Core has earned an excellent reputation for speed and reliability with such products as disk drives for network servers that come with NetWare drivers already installed. Core's new products are high performance, fault-tolerant drive array subsystems designed specifically for IBM's SCSI host adapter, which is used in many of the high-end PS/2s, including the new Models 90 and 95.

Core's CPR-100, CPR-200, and CPR-400 subsystems provide 1.2, 2.5, and 4 gigabytes of storage for \$29,650, \$39,650, and \$59,650, respectively. While these subsystems are not inexpensive, they offer built-in fault tolerance and tremendous expendability. A completely configured system can provide 100GB of disk storage—enough space to store 750 million names, addresses, and phone numbers.

The Core CPR products share some similarities with the drive array Compaq uses in the Systempro: Both product lines offer multiple drives in an array, disk mirroring, disk duplexing, and a data parity drive. The CPRs hold five drives (four for data and one for parity). Users can configure the drive array for data parity or disk duplexing. But that's where the similarity between the Core and Compaq products ends. Core enhances its system with a 386 processor that uses 8MB of memory for disk caching. And Core uses the Berkeley array bus-mastering technique instead of the

programmed I/O IDE interface of the Systempro. Since each subsystem looks like one SCSI identification number, you can attach seven subsystems to one SCSI card.

The CPR subsystems provide the fault-tolerant features needed to operate in a production environment. Running transparently to the operating system, the CPR drive controllers duplex

drive and replace it without bringing down the server. After you replace the drive, utilities provided by Core will reconstruct the data.

In this world of rapidly changing software, the CPR series' seamless integration with IBM shops makes it an attractive alternative to Big Blue's drives. Because the subsystems operate on the IBM SCSI Host bus-master adapter, you won't need any special software drivers. And the CPR products run under a variety of operating systems—DOS, NetWare, OS/2, Unix, Xenix, and any other operating system supporting the IBM SCSI controller.

The CPR subsystems fulfill the mass storage needs of any modern server. They provide fast access times, huge storage capacity, and expandability. By providing redundant power supplies, the CPRs are an attractive alternative to IBM's offerings for network servers in a real-time environment. The ability to change a defective disk drive without interrupting the server's operation makes this system perfect for a production application. With street prices expected to take 20 to 25 percent off the list prices, the CPRs should offer a cost-effective solution for true on-line performance. ■

CPR Fixed Disk Drive Subsystems

Core International, 7171 N. Federal Hwy., Boca Raton, FL 33487; 407-997-6055.

List Price: CPR-100, with 1.2GB storage, \$29,650; CPR-200, with 2.5GB storage, \$39,650; CPR-400, with 4GB storage, \$59,650.

CIRCLE 413 ON READER SERVICE CARD

Core International sells
high-capacity
alternatives to IBM's
external disks.

the data onto the hard disks or use the fifth drive for a parity drive. Duplexing stores the data on two hard disks simultaneously; the parity keeps a check sum of the data on the other drives, as the parity RAM chip in your computer does. If a drive goes down, the backup drives or the parity drive will service the operating system.

Additionally, the subsystem includes three power supplies operating in parallel. If one power supply fails, the other two step up the current to handle the workload until the defective unit can be replaced. The preproduction unit that we saw did not have a separate power switch for each drive, but the production units will. The power switches should allow you to power down the bad

SERIES 400

High-Speed Caching Disk Controller

Unprecedented Hard Drive Performance
at an Unbelievable Low Price!

SERIES 400 Features

- Models available for SCSI, IDE, ESDI, MFM* and RLL*
- Supports two floppy drives (5.25" or 3.5")
- WD 1003 emulation for driverless installation
- All Networks, UNIX, OS/2 and DOS compatible
- Easy installation
- 512 Kb-to-4Mb on-board cache RAM
- Uses low cost 100 nsec SIMMs
- Read and write cache for best overall performance
- On-board 16-bit parallel processor, and data bus with 56-bit ECC
- Dealer upgrades for disk mirroring and more*

Affordable, Lightning-Quick Disk Access

In today's high performance PC's, disk access is the number one system bottleneck. The SERIES 400 from SSDC is a new class of hard drive controller with its own powerful on-board parallel processor and memory to independently manage disk drive data. The SERIES 400 actually anticipates what information the PC is going to need and stores the data in its own high-speed cache RAM. Disk accesses are 100 times faster and large file transfers are up to 10 times faster. This means applications load and execute fast! Even the slowest and most cumbersome applications become lightning quick. All applications - Windows, CAD, large databases, desktop publishing - become supercharged with near instant file access. SSDC has broken the price barrier to hardware disk caching. No longer is powerful disk performance limited to mainframe systems.

SERIES 400 Benefits

- Tremendous increases in system performance
- Accelerates disk access over 100 times
- Increases file transfer rate 5 to 10 times
- Speeds up ALL disk-intensive applications
- Frees up system resources for increased performance

Across the Board Performance Advantage

	SERIES 400	DPT-3011	FTI 2410
Effective seek time	0.270 msec	0.520 msec	0.500 msec
Read data transfers	2230 Kb/sec	892 Kb/sec	1150 Kb/sec
Large record read	16.0 sec	25.0 sec	36.0 sec

Feature Comparison

Retail Price	\$745.00	\$1195.00	\$1595.00
With 4-Mb RAM	\$995.00	\$2095.00	\$2190.00
Max memory on-board	4Mb	4Mb	2 Mb
Memory type	Std. SIMMS	Custom	Custom
WD-1003 Emulation	Yes	Yes	Yes
Custom drivers	Optional	No	Optional
Drive types supported	IDE, SCSI, RLL ESDI, MFM	ESDI, MFM, RLL	ESDI
Networks, UNIX and multiuser systems	All	Most	Most
Boot drive	Any	"C" only	"C" only
1-to-1 Interleave	Yes	No	No
Auto bad track repair	Yes	No	No
Parity check RAM	Yes	NO	Yes
I/O bus speed	12.5	10.0	10.0 (12.5 opt)
Data look ahead	Track	Sector	Sector

Call Today

Cash in on the time you'll save with the SERIES 400 High-Speed Caching Disk Controller from SSDC. You'll enjoy startling increases in system performance, at an affordable price. Installation is simple and the SERIES 400 is fully compatible with all 486, 386 and 286 systems. Call toll free 1-800-284-7732 for your nearest SERIES 400 dealer.

CACHE IN

* 2nd quarter 1991

CIRCLE 346 ON READER SERVICE CARD

SSDC
SOFTWARE
DEVELOPMENT
CORPORATION

1001 Capital of Texas Hwy. South, Bldg. I • Austin, Texas 78746
512/327-8608 • FAX 512/327-5233

Perfection on display.

THE IBM 8515 DISPLAY.

When you're looking for the perfect display to complement your IBM Personal System/2®, the 8515 is clearly the one you should choose.

VGA NOW. XGA ON DEMAND.

Right now you may only need VGA, but as your needs change so

can the 8515. In fact, this display can easily handle picture-perfect high-resolution (1,024 x 768) graphics, either through XGA or an 8514/A Adapter card, depending on what suits your needs best.

QUALITY BY DESIGN.

The 8515 is an affordable 14" display that was designed to be more

reliable. It has fewer parts and that leads to fewer problems—it's that simple.

Add to that a striking contrast-enhancing background and you'll experience clarity and color richness like you've never seen.

Plus, you'll also be looking at almost 50% more viewing area in about the same footprint as our popular 12" display.

The IBM 8515 Display: now all the reasons to choose it are perfectly clear.

Find out more. Contact your IBM Authorized Remarketer or marketing representative. For a remarketer near you, call 1 800 IBM-2468, ext. 913.



(Actual unretouched screen.)



trolled by the current Processor Complexes for the Models 90 and 95, is the 33MB per second of the original Micro Channel specification. This, says Big Blue, is sufficient for CPUs at the current performance level (that is, the 33-MHz 486). When new chips demand more bus performance, Processor Complex upgrades can push the bus throughput of both the Model 90 and Model 95 much higher.

The Processor Complex itself does not use the standard Micro Channel bus. Instead, the bottom of the board sports an edge connector that runs nearly its full length. On the positive side, this wide interface gives the Processor Complex a full 64-bit data path. But the very size of the connector subjects the design to the same criticism that some IBM engineers leveled at the initial (unadopted) EISA proposal. They claimed that the multitude of pins on a connector that ran nearly the full length of an expansion board would make EISA expansion boards so hard to slide into their sockets that people would break their motherboards when trying to push the cards in. Ironically, the IBM Processor Complex requires so much pressure to insert that IBM has attached special levers at either end of the Processor Complex board to allow you to force it into its socket.

The Processor Complex design has other weaknesses. It can be an inefficient upgrade in some situations. For example, if you only want to change the CPU in a Model 90, you have to buy new bus interface circuitry that you otherwise would not need. But the vagaries of the marketplace can overrule the downside of this argument. For example, upgrading a Compaq Deskpro from a 33-MHz 386 to a 33-MHz 486 costs \$3,999, upgrading a Systempro, \$4,999—nearly twice as much as the more complex \$2,500 IBM 33-MHz 486 upgrade.

The Processor Complex design also adds a new connector standard to the Micro Channel repertory and makes the Micro Channel a slippery standard indeed. Because the Processor Complex design allows easy revision of the entire operation of the Micro Channel, what was once fixed in stone (or at least published in technical reference manuals) can be altered at will or whim. Manufacturing Micro Channel-compatible computers may resemble trying to hit a moving target. For computer cloners, such a chameleon standard may be a compelling incentive to march into the EISA camp.

On the other hand, the Processor Complex design may open up an entirely new industry: the making of supercharged upgrades for IBM computers. The poten-

tial is there. IBM's RISC System/6000 has shown that the Micro Channel bus is adaptable to other microprocessor families. IBM has demonstrated that the Model 95 bus can operate at extreme data rates. And the construction of the new systems'

IBM'S P75 PUTS A HANDLE ON 486 POWER

by Winn L. Rosch

IBM, the company that had but one half-hearted attempt at making a 486 PC, has suddenly put the top-of-the-line chip everywhere; it has even introduced the first 486 portable computer legally sold in the U.S.: its PS/2 Model P75 486. Running at 33 MHz, the \$15,990 P75 is the fastest PC with a handle on top—the equal of the uncached 33-MHz Models 90 and 95.

Released at Fall Comdex 1990, just in time for us to take a peek before putting this story to bed, the Model P75 includes many of the features of the Models 90 and 95: built-in bus-mastering XGA graphics, a bus-mastering SCSI interface, and an easily upgradable microprocessor on a card. Except for portability and FCC Class B certification, however, the Model P75 doesn't push technology as hard as the Models 90 and 95.

For example, its standard serial and parallel ports are not DMA-driven, its SCSI performance is more modest because of a smaller cache, and its Micro Channel bus-control logic is kept on the system board rather than a Processor Complex. While standard memory in the Model P75 is the same 8MB as in the Models 90 and 95, it's expandable only to 16MB.

Still, the Model P75 is a formidable computer with few compromises. Built-in is a 10-inch high-resolution gas-plasma VGA screen with a black



Just as we went to
press, IBM delivered a
powerful 486 portable.

background and an output for an external XGA display unit. A 160MB SCSI hard disk and a 1.44MB floppy disk drive are standard; an optional 400MB SCSI drive adds \$2,900 to the base price. The lightweight keyboard features a layout that is identical to the 101-key IBM desktop Enhanced keyboard.

All of this fits into a 22-pound plastic case that measures 12 by 18.4 by 6.3 inches and totes as easily as an over-

night bag. If you need to take power on the road and cost is no object, the PS/2 Model P75 is the machine to wrap your hand around.

Editor's note: For an in-depth review of the IBM PS/2 Model P75 486, see our next issue, *PC Magazine's* second annual special issue on portables.

IBM Personal System/2 Model P75 486

IBM Corp., Old Orchard Rd., Armonk, NY 10604; contact an authorized IBM dealer for information, or call 800-426-2468.

List Price: With 8MB RAM, 160MB hard disk, 8K caching controller, 1.44MB 3.5-inch floppy disk drive, one parallel and one serial port, mouse port, \$15,990; 2MB memory upgrade, \$565; 4MB memory upgrade, \$1,095; 400MB hard disk, \$6,400; external 1.2MB floppy disk drive, \$509.

CIRCLE 635 ON READER SERVICE CARD

cases is substantial enough to assure FCC certifiability far beyond the present speeds of the machines.

SETUP AND DIAGNOSTICS ON BOARD

Another change revealed in the Models 90 and 95 is a new spin that IBM has put on its Programmable Option Select (POS) system configuration scheme. While other IBM PS/2s have used this software-controlled procedure to eliminate hardware conflicts without the DIP switches and jumpers that plagued earlier PCs (and the people charged with supporting them), the new machines eliminate the weakest link in the POS system: the need to keep track of a reference diskette.

The Models 90 and 95 take the logical step IBM should have made long ago. The system configuration procedures are now delivered and maintained on the hard disk that comes standard with each system; as a result, those procedures are always ready when you need them. In fact, if your new PS/2 is not properly set up, the configuration procedures will automatically jump into action.

In addition to the setup procedures, IBM put full system diagnostics on the hard disk. While the system may boot up with enigmatic error messages—8-digit numbers even less comprehensible than the former 4-digit ones—you can select diagnostics from a hidden menu in the configuration program (all you need to do is hit Ctrl-A as you would with any PS/2). The diagnostics will zero in on most problems.

In fact, when the tested Model 90 developed a memory problem, the diagnostics identified exactly in which SIMMs the problem had occurred. The SIMMs were described by the jacks in which they were installed, so neither map nor chart nor ephemeris was needed to find them.

DISK-BASED BIOS

The Models 90 and 95 take this hard-disk dependence a step further. Extensions to the Basic Input/Output Subsystem (BIOS) are also stored on each machine's primary hard disk. While the new computers still have a conventional ROM-based BIOS, additional code is automatically loaded from the disk. This facility lets IBM more easily modify the personality of the system to match upgrades in design and architecture.

Another twist to the BIOS design of the Model 90 and Model 95 allows you to boot the system from either its standard

3.5-inch floppy disk drive, any optional floppy drive, or any hard disk in the system. The selectable boot feature, incorporated into the POS system, is aimed primarily at people who want to run multiple operating systems. They can put each operating system they want to use on its own disk drive, then select which drive to boot from.

The new PS/2s are
flexible and powerful
enough to accommodate
almost any BIOS or
hardware upgrade for
years to come.

To protect the vital disk-based POS and BIOS information from accidental erasure or other damage, it's stored on part of the primary hard disk in such a way you cannot normally access it, even when formatting the disk. The reserved space totals 3MB. This space is invisible, and the material stored in it can be altered or updated only by programs specially written to do so.

IBM sees this disk-based scheme as faster and easier to use. Again, the design goal is flexibility, the ability to make the new PS/2s into entirely new computers to keep up with changes in technology. The Model 90 and Model 95 both are platforms sturdy and powerful enough to accommodate nearly any sort of BIOS or hardware upgrade for years to come.

INSIDE THE WORKSTATION

The packages that bring all these new features to life appear as different as two computers in the same model line—or two products with the same power and purpose—can be. One is a staunch tower, the other a desk-hugging monitor stand. The contrasting packages allow for different expansion options for suiting specific target applications. The desktop Model 90 is IBM's premiere workstation. The Model 95 tower is the server that will link a workgroup together.

Measuring 5.5 by 17.5 by 17 inches

(HWD), the Model 90 is compact and low-slung, resembling nothing so much as a PS/2 Model 70 that had a last-minute growth spurt. The case and styling of the Model 70 and 90 are much the same: The Model 90 has about 2 extra inches grafted onto its right side—apparently devoted to a half-height 5.25-inch drive slot. Like the Model 70, the Model 90 has a single front-panel control, the power switch. But, in the Model 90, the switch has migrated left and is a white push button instead of a toggle. Adjacent to the switch are two indicator LEDs, one each for power and disk activity.

You remove the heavy steel lid of the Model 90 case conventionally by sliding it forward after loosening its two large knurled screws at the upper rear corners of the chassis. A rear-panel cylindrical key lock prevents unauthorized interior access.

MADE OF STEEL

One peek inside, and the system distinguishes itself as more an heir to Compaq's Deskpro than to IBM's Model 70. The chassis itself is a heavyweight steel fabrication with a sturdy aluminum casting reinforcing the rear panel. Although some parts are visible inside the Model 90, they serve no structural roles. Steel holds the entire system together. Plastic is reserved for odd-shaped brackets and similar sculpture. For example, a one-piece molding serves to hold a cooling fan and to guide expansion cards into their slots. Another plastic molding acts as a baffle to form a wind tunnel for cooling the CPU and its associated circuitry on the Processor Complex.

Built into the steel work are four drive bays—three 3.5-inch and one that will hold either a 5.25-inch half-height device or a 3.5-inch drive. The top two bays have conventional front-panel access. The right bottom bay could too if it had some kind of additional plastic front-panel sculpture in place of the line of ventilation slots that runs the full width of the lower half of the Model 90 front fascia. (Although this lower right bay does appear to be 5.25 inches wide when the cover of the Model 90 is installed, only a 3.5-inch bay is provided in the chassis.)

Drives install into these bays with conventional PS/2 3.5-inch drive sleds. The 5.25-inch bay also accommodates the wider sled of the Slim High drive. The front openings of the two bottom bays are covered with snap-in lightweight metal

Absolute Solutions

Computerized Classic	
Accounting for Windows	208

Adobe

Type Set 1 or 2	58
Type Set 3	118
Type Manager for Windows 3.0	58
ATM Windows Plus Pkg	108
Illustrator for Windows 1.0	278
Streamline	218

Aldus

PageMaker 3.01	488
----------------	-----

Aristocad

More Windows	65
--------------	----

ASD Software

Planisoft	138
-----------	-----

Asymetrix

Toolbox for Windows 3.0	294
-------------------------	-----

Autodesk

Autodesk Anim 1.0	228
-------------------	-----

Bitstream

Collections	128
-------------	-----

Bitstream

Face Lift	57
Headlines 1-6	88

Blythe Software

Omnis 5 for Windows	call
---------------------	------

Broderbund

Prompt for Windows	73
Dragnet for Windows	81

Caere

Omnipage 2 1 386	594
------------------	-----

Corel Systems

CorelDraw! 2.0	NEW
----------------	-----

Crosstalk Communications

Crosstalk for Windows	116
-----------------------	-----

Custom Applications

Freedom of Press	238
------------------	-----

Dariana

Win Sleuth	82
------------	----

Dairina Technologies

Per Form Pro for Windows	262
--------------------------	-----

Foresight Resources

Drafix Cad for Windows	434
------------------------	-----

Formwork Corp.

Form Publisher for Windows 1.21	138
---------------------------------	-----

hDC Computer

First Apps	48
Windows Express	47

Individual Software

Professor WINDOWS	26
-------------------	----

Informix

Wingz	328
-------	-----

Micrografix

Charisma for Windows	343
Designer 3.01	454

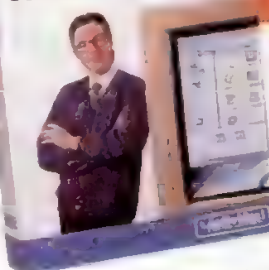
Microsoft

Excel for Windows 2.1	298
Powerpoint for Windows	304
Project for Windows 1.0	424

Windows 3.0 Software

Dev Tool Kit	308
Windows Entertainment Pak	28
Windows Productivity Pak	41
Windows Word 1.1	304

Professor WINDOWS



Individual's Professor Windows

Experience the graphical Windows environment, while you learn about the simplest to the most complex Windows tasks and features. Master Windows terminology, how to use your mouse, even creating directones...you'll learn it all!

Professor Windows\$26

OCR Systems

Readright for Windows v3.0	429
----------------------------	-----

Okna Software

The Desktop Set	85
-----------------	----

Precision Software

Superbase 4 for Windows	398
-------------------------	-----

QMS

Ultrascript PC Plus 2.1	248
-------------------------	-----

Quarterdeck Office Systems

QEMM 5.1	52
----------	----

Reference Software

Grammatik Windows	47
-------------------	----

Samna

Ami Professional	288
------------------	-----

Softview

Macintax for Windows	66
----------------------	----

T/Maker

Clickart:	
-----------	--

Business Cartoons	41
-------------------	----

EPS Business Art	79
------------------	----

EPS Illustrations	84
-------------------	----

Holiday Images	44
----------------	----

Personal Graphics	44
-------------------	----

Publications	44
--------------	----

Xerox

Ventura Publisher Gold 3.0	518
----------------------------	-----

With every purchase of \$100 or more in Windows products receive a FREE copy of Professor Windows

Utilities

Above Software

Above Disk 3.1	54
----------------	----

Bloc Publishing

Disk Vision 1.1	44
Pop Drop Plus	55

Borland International

Sidekick Plus	128
---------------	-----

Central Point Software

Copy II PC 5.0	21
PC Tools Deluxe 6.0	81

Dariana

System Sleuth	82
---------------	----

Delta Technologies

Direct Access	58
---------------	----

Fifth Generation

Brooklyn Bridge 3.0	74
Mace Utilities 1990	84
Mace Vaccine 5.0	54
Fastback Plus 2.1	108

Funk Software

PDQueue	53
Sideways 3.3	36

Gibson Software

Spirit II 1.1	64
---------------	----

Helix

Headroom 2.1	67
--------------	----

Lotus

Magellan 2.0	98
--------------	----

Merril & Bryan

Turbo EMS	48
-----------	----

Multisoft

PC Kwik Power Disk	45
PC Kwik Power Pak	68
Super PC Kwik 3.3	42

On Track Computer

Disk Manager DOS 4.2	48
----------------------	----

Prime Solutions

Disk Tech Advanced 6.0	87
------------------------	----

Qualitas

386 Max Professional	68
----------------------	----

Quarterdeck Office Systems

Desquiv 2.3	68
QRAM 1.0	42
QEMM 5.1	52

Softlogic Solutions

Software Carousel	47
-------------------	----

Symantec

Norton Utils Adv. 5.0	108
-----------------------	-----

Zenographics

SuperPrint 1.1 for HP Laser	113
-----------------------------	-----

Desk Top Set

The DeskTop Set personal and business organizer combines the following essential programs into a powerful, flexible and easy-to-use system

The DeskTop Set features Calendar, Appointment Book and "To Do Lists", Printing Calculator with revisable Tapes, Programmable Dialer with phone log and area code Directory and Phone Book with business and personal databases

Desk Top Set\$82



with Phone Log and Area Code Directory
Phone Book with Business and Personal Databases

The DeskTop Set

Ami Professional

Ami Professional, the powerful word processor for Windows feature macro programming, thesaurus, tables, drawing and charting, and more. Distinguished by exceptional ease of use, Ami Professional has won a number of prestigious awards, including the #1 rating from Software Digest

Ami Professional\$288

Entertainment

Broderbund

Simcity	27
The Playroom	24

Where in the World is Carmen	
San Diego Deluxe	49

Electronic Arts

Secret of Monkey Island	45
The Games People Play	29

Stormovik: SU-25 Att. Ftr	35
John Madden Football	30
Madden Stats Disk 1989	19
Populous	38

Electronic Arts

Starlight 2	38
-------------	----

Microsoft	
Flight Simulator 4.0	38
Aircraft & Scenery Design Kit	28

Simtux Limited	
Xybergenic Ranger	49

KOR Corporation	
NFL Challenge	59
Roboman	25
Basketball Challenge	25

Adobe Type Manager

The tool that automatically makes your screen and printed text clearer. Easier to use than font generation software and offers more sizes and styles than cartridge products. Works with any font in the Adobe Type Library

Adobe Type Manager\$58

Adobe Type Manager



Weekday Order Hours:

8am to 1am EST
5am to 10pm PST

Weekend Order Hours:

9am to 9pm EST
6am to 6pm PST

5 New Century	123
6 Optima	103
8 Lubalin Graph	123
9 Garamond	104
10 American Typewriter	93
11 ITC Benguiat & Friz Quadrata	123
13 Helvetica Light Black	104
16 Melior	123
20 Goudy Old Style	123
21 Sonata	61
22 Century Old Style	93
23 Franklin Gothic	180
24 Cheltenham	123
25 Park Avenue	61
26 Bodoni	123
27 Letter Gothic	123
28 Prestige Elite	123
33 Stencil Hobo	83

38 Univers Condensed	180
40 Stone Serif	180
41 Stone Sans	180
42 Stone Informal	180
44 Eurostile	180
47 Futura Condensed	243
50 Helvetica Compressed	93
51 Italia	93
57 ITC Kabel	123
58 OCR-A, OCR-B, Micr	93
59 Helvetica 1	123
60 Helvetica 2	180
72 Caslon Open Face	81
85 Tempo 13, Gothic	93
86 Cochlin	123
87 Bauhaus	123
90 A Booklin, F. Fraktur, Present Script, Helv. I.	123
98 Bauer Bodoni	123

100 Adobe Garamond	175
101 Adobe Garamond Expert Collection	123
106 ITC Berkeley	225
109 Minstrel / Reporter	93
110 Nuptial/Cascade/Medici	93
114 ITC Novarese	175
115 Kunstler Script	93
117 Souvenir 2	123
118 Bodoni II	123
122 Cottonwood / Ponderosa / Ironwood / Mesquite / Juniper	123
130 Eurostile EXT & Cond	123
131 ITC Weidman	243

We carry the entire Adobe Type Line. Call for Prices

Education

Bloc Publishing		PC Globe Inc.	
Personal Lawyer	34	PC Globe 4.0	34
Lifestyles Edition	38	PC Nations	18
Harvard Associates		PC USA	34
PC Logo 3.0	call	Penton Overseas	
Individual Software		French, German, Italian	
Professor Dos 4	26	Japanese, Hebrew, Russian,	
Professor Windows	26	and Spanish, Levels I, II	38
Learning Company		True Basic, Inc.	
Math Rabbit	23	Algebra 4.0 + Workbook	48
Reader Rabbit	23	Arithmetic	48
Writer Rabbit	25	Calculus 4.0 + Workbook	48
Nolo Press		Pre-Calc 4.0 + Workbook	48
Willmaker 4.0	33		

Programming

Microsoft	
Basic Professional	
Dev. Sys. 7.0	298
C Compiler 6.0	304
Macro Assembler	90
Quick Basic 4.5	60
Quick C 2.5	60
True Basic Corp.	
True Basic 2.1	51
Utah International	
Turbo C++ Prof. 1.0	169
Turbo Pascal Prof. 5.5	158
Digital	
Smalltalk/V 2.0	58

Application Techniques	
Pizzazz Plus	64
Ashton-Tate	
Applause II	call
Brightbill Roberts	
Show Partner F/X 3.6	223
Electronic Arts	
Bannermania	20
New Print Shop	34
Formgen Corp.	
Formgen Plus 5.0	138
Formgen w/ Fill & File 2.5	78
Formwork Corp.	
Formwork w/ Fill & File 2.5	78
Lotus	
Freelance Plus 3.01	317
Market Street Software	
Grip Graphic Print Utility	75

PC Publishing	
Impress	68
Personics	
Ultravision 2.0	78
Software Publishing	
Harvard Graphics 2.3	285
PFS: First Publisher 3.0	81
Timeworks	
Publish It! 1.2	114
Publish It! Lite	32
Unison World	
Avagio	168
Xerox	
Gray F/X	298
Zenographics	
Pixie 2.0	164
Bloc Publishing	
Form Filler 3.0	77
Form Tool Gold 3.0	49

25 Plus/Charisma

No more downloading fonts or switching cartridges - save money and time! This multi-font master cartridge has over 150 fonts that includes Times Roman, Helvetica, Prestige Elite and Letter Gothic in point sizes from 3.6 to 30 points. Add additional fonts, letterhead, signatures and forms by simply plugging in modules. The 25 Plus/Charisma is compatible with all HP printers Series and works with all leading software.

25 Plus Charisma \$275

Cartridges Sold Separately



Instant Recall

Instant Recall is a full featured Personal Information Manager that runs in only 32k. Instant recall manages both freeform and structured information, allowing up to 65,000 characters (30 pages) of text for each entry.

Instant Recall \$63

American Small Business	
Design Cad 3D	187
AutoDesk	
AutoSketch 3.0	94
ComputerEasy Software	
Dream House Professional	46
Floor Plan	25

Foresight Resources	
Draft Cad Ultra	231
Generic Software	
Basic Home Design Symbols	30
Generic Cad 3D Drafting	call
Generic Cad 5.0	234
Mathsoft	
MathCad 2.5	292



Microsoft Excel 2.1D

The most powerful spreadsheet designed especially to give you every advantage of the latest PCs, laser printers, and high resolution screens. Powerful features bring you more productive ways to analyze, customize, and present financial data.

Excel 2.1D \$298

Business & Presentation

Ashton-Tate	
Postscript Cartridge	238
Type Cartridge 1 or 2	228
Ashton-Tate	
dBase IV 1.1	478
Multimate 4.0	244
Asksam Systems	
Asksam 4.2	158
Avery	
LabelPro (Laser)	43
Borland International	
Paradox 3.5	498
Quattro Pro	309
Brimber	
Memorymate 3.02	37
Chronologic Corp.	
Instant Recall	63
Contact Software Int'l	
ACTI	228

Fox Software	
Foxbase+ Development	
System 2.1	178
FoxPro	418
Individual Software	
Resume Maker 1.1	28
Lotus	
Lotus 1-2-3 3.1	428
Microsoft	
Word 5.5	204
Olduvai	
Read-It! OCR Personal	145
Rightsoft	
Rightwriter 4.0	52
Spinnaker	
The Resume Kit	24
Symantec	
Q&A Write 1.01	131
Wordperfect Corp.	
Wordperfect 5.1	244



Microsoft Word 5.5 - New Version

Version 5.5 makes it dramatically easy to access even the most powerful features with just a couple of simple keystrokes. Packed with the best word processing features available, plus the mouse support and shortcuts that get you to those features quickly and easily.

Word 5.5 \$204

- We accept Visa, MasterCard, Discover, American Express, and wire transfer
- Your credit card will not be charged until order ships
- PO's accepted subject to credit approval
- No sales tax (except WA. residents 8.1%)
- We reserve the right to limit quantities
- Prices, terms, and product availability subject to change without notice
- All products covered by a 120 day limited warranty in addition to manufacturer's warranty. Defective software replaced immediately. Hardware replaced or repaired at our discretion
- Airborne Express overnight delivery add \$8 per order (up to 7lbs. add \$1 each add'l pound). Alaska and Hawaii included

- UPS Ground shipping \$3 in continental US
- APO/FPO orders shipped 1st class mail \$3
- International orders pay actual shipping and handling
- Orders placed by 8:30pm Eastern Time, 5:30pm Pacific Time (weekdays) for "in stock" items, ship same day (barring system failure, etc.), for overnight delivery

Copyright © 1990
Multiple Zones International, Inc.
The PC Zone is a trademark of
Multiple Zones International, Inc.

18005 NE 68th Street, Suite A110
Redmond, Washington 98052
International - (206) 883-1975
Fax Line - (206) 881-3421

Compuserve	
Dos Membership Kit	18
Datostorm Technologies	
Procomm Plus 1.1	62
Dynamic MicroProc. Assoc.	
PcAnywhere IV	98

Hilgrave	
Hyperaccess/5.1.1	108
Microcom	
Carbon Copy Plus 5.22	109
Carbon Copy Autopilot	52

stampings to reduce radio-frequency emissions.

Standard equipment fills the two left bays of the Model 90, the top with the 1.44MB floppy disk drive, the lower with the system's factory-installed hard disk.

The bottom of the chassis is lined by the Model 90's 9.5- by 14-inch system board. Although part of the board is hidden underneath the system's 205-watt power supply, all components that you might need to deal with are readily accessible. (That's because there's very little on the system board that you'd need to access.)

The power supply has its own built-in 3.5-inch fan and provides three drive power connectors, sufficient to supply each of the internal bays of the system. (IBM's 3.5-inch floppy disk drive does not require a separate power input cable.) The power supply automatically adjusts to either U.S. (115-volt) or European (230-volt) electricity. No jack to supply switch power for a monitor is available on the Model 90's rear panel.

Because the system board functions more as a passive backplane than a conventional IBM PS/2 system board, only support functions are built into its circuitry. Among them is the system clock, which uses a 3-volt lithium button cell for power rather than the larger battery of IBM's previous PS/2s. Also built into the system board are the Model 90's standard ports—one DMA parallel port, two DMA serial ports, a keyboard port, and a mouse port. Also part of the system board are the floppy disk controller, which can handle up to two drives, and two unused IDE connectors for hard disks (one located behind each of the two lower drive bays).

Although the Model 90's system board XGA circuitry is mostly hidden under the power supply, the only parts of it that you might need to touch—its memory chips—are out in the open. Standard in the Model 90 is 512K of XGA memory in the form of four VRAM chips. An additional four chips will increase XGA memory to 1MB and increase the number of colors the system can simultaneously display at its highest resolution from 16 to 256. The IBM PS/2 Video 512K Memory Kit for making this upgrade costs \$350.

The system board also offers four standard 32-bit Micro Channel slots, one of which offers a VGA feature connector extension. Only one slot is filled in standard Model 90 systems—the leftmost slot holds IBM's 32-bit bus-mastering SCSI

adapter—leaving three for potential expansion. For external expansion, a SCSI port is available on the retaining bracket of the SCSI host adapter.

Just right of the four Micro Channel slots is the special 64-bit slot for the Processor Complex. Despite IBM's claim of putting all of the Model 90's memory on the system board, system RAM is actually installed on two proprietary memory boards to the right of the Processor Complex.

Each of these two boards can accommodate zero, two, or four proprietary IBM SIMMs with either 1MB, 2MB or 4MB capacity. When 8MB SIMMs become available, the Model 90 can take advantage of them to push its total addressable memory to 64MB. The system will accommodate and automatically adjust itself to any of these SIMM sizes as long as the SIMMs are rated at 70, 80, or 85 nanoseconds, but only 70-ns. SIMMs will yield top performance. Because the memory is interleaved, SIMMs must be installed in pairs of equal capacity.

The two memory boards are held in place by a spidery plastic casting. This same casting also serves to hold in place a large ferrite slug that's wrapped around the SCSI cable running inside the system.

Overall workmanship is very good, as you'd expect from IBM. Wiring is kept to a minimum (except for the snaky SCSI cable, which has to be long enough to connect up to three devices inside the chassis). The only hint of a snarl is the two sets of cables linking the front control panel and secondary cooling fan to the system board.

INSIDE THE SERVER

The Model 95 is designed to be the most expandable machine in IBM's entire PS/2 line. The time-proven hull of the Models 60 and 80 evidently proved insufficient to hold all of the Model 95's expansion potential, so IBM injected its old tower package with steroids. The thing is so big and ominous that you wouldn't want to run into one in a dark alley.

The chief difference between the old and the new bulked-up tower packages is that the latter is wide enough to accommodate 5.25-inch drives mounted horizontally. The Model 80 required vertical mounting of larger forms of disk and tape devices. In all, the new Model 95 is about 25 percent wider than the old Model 80.

At the same time, the height and depth of the chassis were reduced to produce a short, squat package that measures 19.5 by 8 by 20.5 inches.

The real gain is inside. Whereas the old towers held but two full-size 5.25-inch drives, the new tower can pack five half-height devices in addition to two 3.5-inch drives (one of which will be the standard 1.44MB drive included in each Model 95). All of these devices except the one on the very bottom of the tower have front-panel access. The bottom bay is reserved for the standard 3.5-inch SCSI hard disk that comes factory-installed.

The unused bays are filled with dummy plastic drives and covered with snap-in blank panels that have been treated with interference-reducing paint. Removing a blanked panel is no longer irreversible (as it can be with some compatibles). The blank panels in the Model 95 fascia remove easily and snap back in place. Inexplicably, however, the blanks for each of the bays are somewhat different, requiring a varied inventory should you harbor and maintain several Model 95s.

Adding or inserting drives is equally easy. Drives are held in place by a large steel panel, normally hidden by the dressy plastic front panel of the system. Laced with cut-outs, one for each drive bay, this steel panel covers the entire front of the chassis. Unsnapping two latches at the top releases the panel and allows the drives to slide forward and out.

The mounting used in individual drive bays varies. For example, IBM has combined a 5.25-inch bay adapter with a rail-mounting assembly to hold the standard 3.5-inch hard disk in place. The rails at the sides of the adapter slide into the molded plastic channels that define the sides of the bay. A small metal spring-snap helps secure the left rail of the drive and hold it in place. The channel-like guides on either side of the bay will accommodate standard-size AT drive rails, although they might not be positively held by the snaps. On the other hand, the two 3.5-inch bays use PS/2-style plastic sleds to hold their drives in place.

Wiring in the system comes in the form of a ribbon cable with the appropriate number of connectors to link together up to five SCSI devices. In addition, IBM provides power connectors for as many as five internal devices. The power cable that runs to the hard disk includes two extra power connectors, and a supplementary power cable with two more power

connectors is supplied on one of the dummy plastic drive inserts. Two additional plastic pieces for adding drive-mounting channels are also included inside the system.

BIGGER, MORE EXPANDABLE

The added width of the Model 95 brings another benefit for the system's expandability. The greater interior space allows expansion boards in the system to be substantially taller than those that could fit into the old PS/2 towers and small-footprint Micro Channel computers, including the Model 90. In fact, the Model 95 allows expansion boards that reach the

full height of AT boards to fit comfortably inside the chassis.

While AT expansion boards won't plug into Micro Channel expansion connectors, the taller boards designed for IBM's RS/6000 minicomputer will. In fact, IBM plans to offer many of the same boards designed for the RS/6000 for the Model 95, starting with those that will most enhance the Model 95 when it is used as a file server (the RS/6000 token-ring network adapter, for example). The benefits of such intercompatibility between systems run in both directions. The Model 95

gains access to high performance expansion boards designed for the RS/6000. The RS/6000 gains, too, because board designers have a larger market for their products. This design, IBM believes, will encourage more companies to develop expansion products for both the RS/6000 and the Model 95.

When you try to get inside the Model 95, you'll find the system filled with surprises. The first of these is the tool-and-fastener-free removal of the chassis cover, a steel panel that makes up the right side of the computer. After a cylindrical security key lock at the bottom of the plastic front panel is unlatched, the fascia of the Model 95 can be snapped out, and the right side of the computer easily lifts off.

Attached to the removable side of the Model 95 is a long, narrow squirrel-cage fan that cools the Processor Complex. No wires connect the fan to the rest of the chassis. Instead, two metal fingers contact tabs in the main chassis to receive a supply of twelve-volt DC current to run the fan. This clever expedient makes removing the cover much less of a hassle. Besides the elongated fan, additional cooling is provided by a huge, 5-inch fan in the power supply.

Blocks of foam are attached to the cover to direct the flow of cooling air inside the chassis. We also detected an indication of the Model 95's minicomputer origins: a pair of clear plastic envelopes attached to the side, obviously designed to be carriers of the system's maintenance log.

Another indication of the minicomputer origins of the Model 95 and its target environment is the laconic diagnostic display at the top of its front panel. Unlike some computers with diagnostic displays that attempt to guide you along in a Pidgin English, the eight digits of the Model 95 display speak only a strange engineering dialect. As the machine boots, it steps through such cryptic messages as CP: 20, CP: 40, CP: 85. Once the system has booted, the display blanks off. This marks the Model 95 as a machine to be tended by network wizards who wear black robes and carry magic wands.

Inside the Model 95, the design is more friendly toward normal humans. While about half of the 11- by 18-inch system board is covered by the 329-watt power supply, that's no problem. The big metal box (taped with some afterthought interference protection) pivots down to reveal the whole system board. Holding the

OS/2 1.3: Faster, Slimmer, and Better-Looking

by Gus Venditto

It used to be that the introduction of a new IBM personal computer would herald an upgrade to DOS. But that's not the case in the '90s.

Last fall's introduction of the PS/2 Models 90 and 95 was coupled with an OS/2 upgrade, even though a significant enhancement to DOS was going through the final stages of testing.

OS/2 1.3 started life as a troublemaker. It not only brought IBM and Microsoft strategists to blows, it nearly led to a divorce between the two.

To Microsoft and all other visionaries, OS/2

1.3 is too little, too late. It doesn't use the TruImage page description language that Microsoft is developing with Apple, and it delays the introduction of OS/2 2.0, the 32-bit version that is nearing completion.

To IBM and pragmatists, OS/2 1.3 is the performance upgrade that the operating system has needed all along.

Version 1.3 is quicker, has Adobe PostScript's display fonts built in for good looks, and runs in less memory. A lot less memory, in fact. The operating system's minimum memory requirement was dropped from 4MB to 2MB to facilitate use with typical applications, making it a realistic proposition on machines where attempting to run Versions 1.1 and 1.2 seemed like an impos-

sibility and a cruel joke.

The performance enhancements include small things, like easier addition of printer drivers and faster program loading due to smarter use of rarely needed overlay files. IBM has also made sure that the popular printer drivers are ready, whether you use Epson, Hewlett-Packard, or IBM printers.

And taking a page right out of *Windows'* memory management scheme, OS/2 1.3 automatically manages a swapdisk, looking at the available RAM and adjusting the size of the swapdisk accordingly.

The real improvements in OS/2 1.3 come from old-fashioned code enhancement. Finished copies weren't ready in time for this story, but from previews we saw, it was clear that Version 1.3 has more snap in just about every area.

And on the Model 90, Model 95, or any machine with XGA, OS/2 1.3 should prove very impressive, since XGA includes bit-blitting techniques that were designed specifically to accelerate OS/2's window-centric screen redraws.

IBM regards this latest version of OS/2 as a stable platform for growth. The question now is: Has *Windows* stolen the thunder that this version would have earned by itself? ■

**The latest release
of OS/2 requires
only half the
memory of the
old version.**



To understand
the basic
principle behind
Fastback Plus,
tear out
this page
and destroy it.

LIKE A BOLT FROM THE BLUE,

your hard disk will eventually come crashing down. Manufacturers expect it. They even give hard disks an "MTBF" rating—the Mean Time Between Failures.

Before you lose your valuable data, back it up with Fastback Plus.

BACKUPS IN A FLASH With Fastback Plus, you can do things that DOS Backup never dreamed of. Like back up all your daily file changes in less than a minute. Or blaze through your entire hard disk at three megabytes a minute on 386 machines, or 10 megabytes in four minutes on an AT. It even formats your backup diskettes—automatically.

STRIKING SIMPLICITY Fastback Plus has three user levels—beginner, intermediate and advanced. Simple menus tell you how long your backup will take, and how many diskettes you'll need. And a unique data compression feature cuts the number of diskettes you need in half. You can even automate the entire process with one-touch macros.

DAZZLING SAFETY Only Fastback plus gives you reliable Advanced Error Correction. To illustrate, we punched a hole

larger than a .22 calibre slug right through a backup diskette—and retrieved all the data! That's security. And if you need help dodging even bigger bullets, our technical support staff will surprise you with its courtesy and ingenuity. Just call, and you're guaranteed same-day service.

GLOWING REVIEWS *PC Magazine* said it best in giving Fastback Plus its prestigious 1989 Editor's Choice Award: "Fastback Plus has virtually everything a backup program needs: top-speed performance, clear menus, every imaginable option, even a built-in macro program for automating complex tasks. A superb achievement."

A POWERFUL GUARANTEE Use Fastback Plus for 30 days, and if you're not completely satisfied, return it for a full refund. You have nothing to lose. And everything to save.



FREE PYRO For a limited time, get a FREE copy of Pyro!™, our popular screen-saving program just for writing "Pyro" on the Fastback Plus registration card before you return it. That's a \$49.95 value—free!

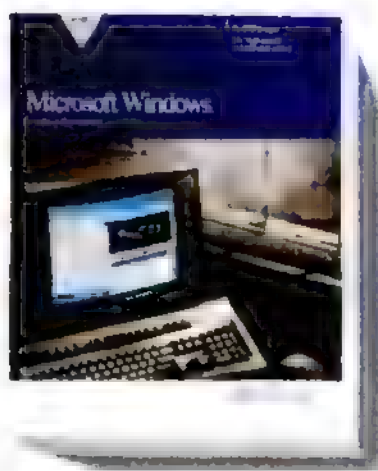
Call now for complete details and the dealer nearest you.

1 - 8 0 0 - 8 7 3 - 4 3 8 4

The perfect en the lazy and p



Environment for power-hungry.



The Microsoft® Windows™ graphical environment version 3.0 makes it easy for you to do a lot more with your PC. That's

because the Windows environment has friendly icons, menus and dialog boxes that make its powerful features very accessible.

Windows lets you work with a variety of applications on-screen at the same time. Including your character-based programs.

But it's when you start using Windows applications that you get the most out of your PC. Windows applications are easy. In addition they all work essentially the same way. So once you learn how to use one, you generally know how to use them all.

And they're so intuitive that experimenting with them is fun.

Windows applications let you

cut and paste text and graphics. And let you combine them right on your screen. They also let you print out exactly what you see.

You can even establish links between Windows applications. Which means, if you change any numbers in Microsoft Excel for Windows, the chart you cut and pasted into your Microsoft Word for Windows document will be automatically updated.

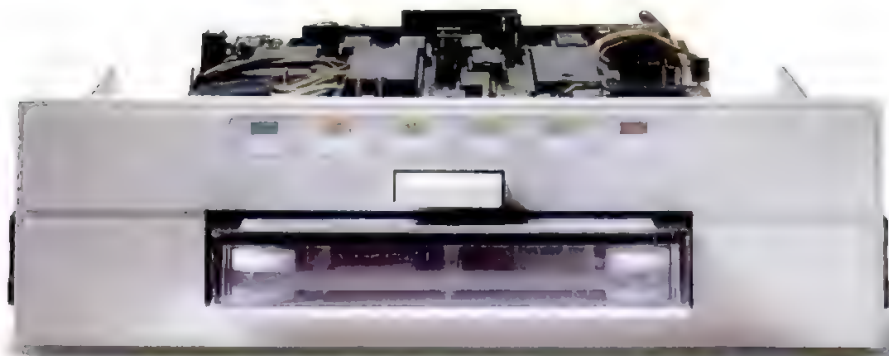
So call us at (800) 541-1261, Department P30, to find out more about Windows, Windows applications or the big Windows World Conference and Exposition coming up May 20th-23rd in Atlanta.

Because with Windows, you can start taking the work you do every day a little easier.

And have more to show for it.

Microsoft®
Making it all make sense™

At 120_{MB}
for \$359,
we've given
new meaning
to the word
value.



Now each Everex™ Internal Floppy Tape Backup system comes with data compression software for double the storage. So you can get up to 120MB with the Excel™ 60F. All for an introductory price of just \$359. (Or \$379 with tape.) Call us at 1-800-468-EVER. Don't wait. After all, even good values have time limits.



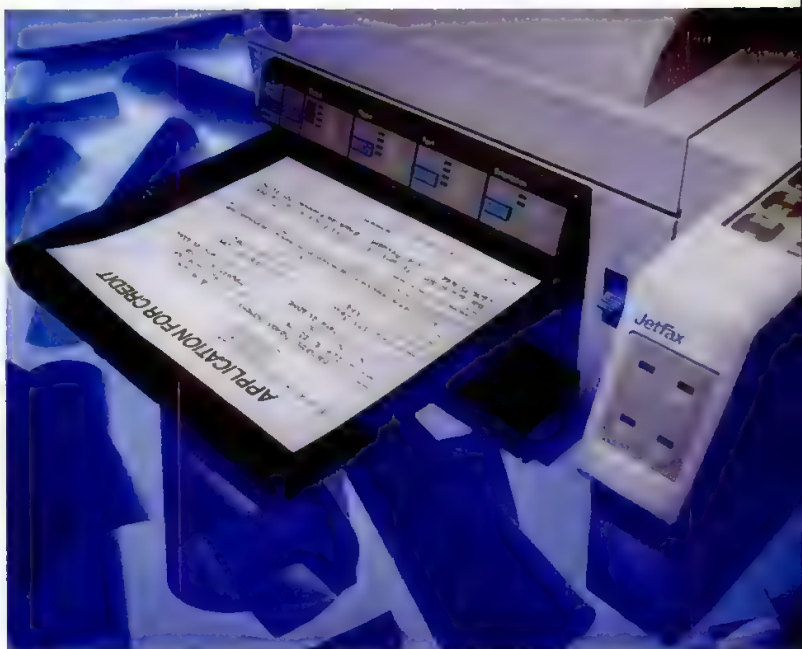
Inquiries from outside the U.S., call 415-498-1111 or fax 415-651-0728. Calls from Canada, use 1-800-663-5161. EVER for EXcellence is a registered trademark and Everex and Excel are trademarks of Everex Systems, Inc. © 1990 Everex Systems, Inc.

CIRCLE 107 ON READER SERVICE CARD

Plain-Paper FAX Devices

**NO CURLS, NO SHINE,
NO PROBLEM**

No one likes to read curly, shiny, thermal hard copy, but regular fax machines that use plain paper are expensive. These devices provide a high-quality, cost-effective alternative.



by Frank J. Derfler, Jr.

Whether you love them or hate them, fax machines are here to stay. Today, everyone doing business across town or across continents must have a fax machine to be competitive. Recent tests at PC Magazine LAN Labs show that simple fax devices generally work more reliably than expensive modems over cellular telephone links (see "Data on the Go: Three Cellular Modems," *PC Magazine*, December 25, 1990), so fax machines will even follow many people from the office out onto the road.

As fax machines proliferate, companies continue to come up with new and exciting features. Generally, the machines have become smaller and less expensive as they have improved in quality and ease of use. Modern options allow one fax machine to call others at preset times and poll them for documents in their feeder trays, and also to use clever security schemes like callback to avoid receiving any unwanted junk faxes. Add-on devices called *fax line managers* allow a fax machine, voice telephone, and data modem to share a single incoming telephone line (see "Fax Line Managers: The Electronic Call Director," *PC Magazine*, December 11, 1990).

Despite these improvements and innovations, one irritating element still remains: that darn paper! Everyone dislikes loading, handling, and reading the thermal paper that most fax machines use. Certainly, fax machines printing on plain paper are available, but companies like Sanyo and Sharp price their current offerings in the \$4,000 to \$5,000 range. Most people can't justify paying the \$3,000 to \$4,000 increase over a standard thermal paper system just to keep the paper from curling.

REVIEW CRITERIA

In this review, we take a look at three devices—Extended Systems' FaxConnection 5011A, the JetFax, and Tall Tree Systems' Fax-O-Matic—that connect to or install in a laser printer and deliver your incoming faxes on flat, white, plain paper with excellent quality. Better yet, they range in cost from about \$400 to \$1,000, which is a far cry from the high price tags attached to fax machines that print on plain paper. Finally, these products don't need a PC to deliver received faxes.

We also look at an unusual Swiss Army knife of a fax device, Relisys's Tefax System Model RA2110, in our sidebar "Tefax: The Versatile Do-It-All Faxon." A standard desktop fax machine with an RS-232C link to a PC, the Tefax provides a variety of faxing options, including receiving faxes on plain paper when connected to your laser printer, at a reasonable price—just a little over \$1,000.

The plain-paper fax devices we review reside in or connect to a printer with graphics capability (typically an HP LaserJet or compatible) on one end, and they can hook up to a PC on the other—although

Plain-paper fax devices cost from about \$400 to \$1,000, a far cry from the price tags attached to fax machines that print on plain paper.

it is not necessary that they be attached to a PC at all. They connect to the phone line, answer incoming calls, and then send the incoming fax images directly to the laser printer. JetFax can send faxes from a PC too, but sending faxes from a PC is already so easy that the transmission capability is secondary.

In fact, you can send faxes from a PC in many ways. You can install an internal fax adapter on a single PC or share a fax adapter across a network using a fax gateway, purchase a data modem with fax transmission capability, use an electronic mail program, or let a service like MCI Mail send the fax for you. The primary benefits of using a PC to send a fax are simplicity and the clarity of the transmitted image. Since the image, either graphic or ASCII, goes directly to the fax modem without passing through the steps of printing and scanning, it's sharper and cleaner than one scanned in from paper, and there is less handling.

Of these options, internal fax adapters, networked fax boards, and electronic mail systems with a tie to fax systems (*cc:Mail* is an example), provide for the reception of faxes as files as well. The latter two options are generally frustrating in that they typically offer no automatic way to tell who is supposed to receive the incoming fax; someone must look at every incoming message and route it to the addressee. (While some new systems identify addressees by reading a phone number or a person's name in the first line of text, these techniques have limited application.) And all three options are frustrating when it comes to receiving an image and trying to read it on the screen; in most cases you can't see the whole image at once, and the screen presentation is slow.



EDITORS' CHOICE

• FaxConnection 5011A

All three of the plain-paper fax devices we examined work well, and each is both easy to install and simple to use. You'd be well served by the features included with any one of them.

The JetFax offers its features and flexibility at a rather high price. While it provides you with the ability to transmit faxes in the form of a \$295 optional software package, we're not sure the added capabilities are worth the added price. Even without the software, the JetFax will set you back about \$1,000.

At \$399, the Fax-O-Matic has the right price. But though its printed output is definitely better than what you can expect from a thermal fax machine, it just isn't quite as sharp as output generated

by the competition.

At \$595, Extended Systems' FaxConnection 5011A is just right, being both reasonably priced and a good performer. Its hide-away design is an attraction for anyone who owns a real Hewlett-Packard LaserJet II, IID, or III printer (its support of only a handful of printers would be a drawback had they not been the widely used HP devices). Those with compatible printers or an HP LaserJet IIID can look to the somewhat costlier but still moderately priced external version of the product that should be available by the time you read this. In fact, we like Extended System's FaxConnection 5011A so much that we're ordering one to use as a permanent fixture of PC Magazine LAN Labs.

COMMUNICATIONS

PLAIN-PAPER FAX

THE PC FAX BOARD COMPETITION

While the devices we rounded up for this review don't solve the problems associated with receiving faxes as files on a PC, they do make it easy and economical to receive the faxed images on plain paper.

Of course, many internal fax adapters that install in PCs can automatically route incoming faxes to a printer attached to a port on the host PC. Most of these boards can send the faxes to a plain-paper printer without user intervention once the TSR software is set up. But the process of receiving and printing fax images generates a stream of hardware interrupts inside the host PC. These interrupts reduce the CPU power that is available to run foreground programs. When an incoming fax image moves from the telephone line to the printer, all other processing slows to a crawl, so you'd only want to choose this option in special circumstances.

If you have a little-used PC that you can practically dedicate to running one of these internal fax boards, setting it up to receive plain-paper faxes is a convenient and painless option that won't really affect your productivity. The advantage of this scheme is that such internal fax adapt-

ers can sometimes be less costly than the plain-paper fax devices reviewed here, and they also provide the ability to send fax files as a standard feature.

Whether your faxed image arrives via an internal adapter installed in the PC or one of these plain-paper fax devices, the laser printer to which it is directed sees it as a graphics image. The printer needs both time and internal memory to process and print the image. You should have at least 2MB of RAM in the laser printer to handle the fax printing job. Thermal fax printers will typically deliver the finished image a few seconds faster than laser printers, but the lasers' results are worth the wait.

Because they electrically and physically sit between the PC (sometimes even a PC acting as a network print server) and the printer, the plain-paper fax devices control the flow of print jobs to the printer. You can give priority to printing either the faxes or the tasks coming from the PC. If the printer is busy with a fax, the PC simply waits. If the printer is busy with local print jobs, the plain-paper fax de-

vices can store incoming faxes until it is free. The top-end JetFax can also scale incoming fax images to the available paper size and can order the LaserJet to switch paper trays and use legal-size paper.

FAX WITHOUT FUSS

In our performance tests, we measured the time from the beginning to the end of the connection—the time you would pay for during a telephone call—and found only a very small difference in speed among the three systems tested.

All three products produced high-quality images on plain paper, with the FaxConnection 5011A providing the clearest and most complete images. The Fax-O-Matic took the longest time to *train*—to establish a common protocol—with the calling fax machine, which accounted for its longer connection time in our tests.

Two factors held true across all three devices: These products are simple to install and easy to use. Essentially, you set them and forget them; all they do is work. And that's exactly what you would want from this kind of device.

EXTENDED SYSTEMS INC.

FaxConnection 5011A

by Lisa Cady Newell

You'll be ready to receive high-quality plain-paper faxes within minutes after opening the box containing Extended Systems' FaxConnection 5011A. Just make sure that you have a Phillips-head screwdriver within arm's reach.

This \$595 board easily and painlessly installs in your laser printer. While it does not give you the option of sending faxes unless you use additional hardware, it generates better images with the faxes it receives than any of its competitors.

The FaxConnection operates with a Rockwell chip set and a Z80 microprocessor chip. It supports the Hewlett-Packard LaserJet II, IID, or III, but not the original LaserJet or any compatibles. To install the board, all you do is slip it into your printer's I/O port, then issue a few simple commands to tell the printer to load the Roman 8 font and use the I/O port. The FaxConnection includes a parallel port and two RJ-11 jacks: one for fax reception, the other for sending faxes. To send faxes, you need a PC fax adapter or an interface to a fax machine. Either way, the FaxConnection and the additional hardware can share the same phone line.

PLAIN-PAPER FAX DEVICES: SUMMARY OF FEATURES

Products listed in ascending price order

	Tall Tree Systems Fax-O-Matic	Extended Systems Inc. FaxConnection 5011A	JetFax Inc. JetFax
List price	\$399	\$595	\$995
Includes	Parallel cable, RJ-11 cable, power supply	RJ-11 cable	Parallel cable, power supply
Size	2" x 4.5" x 6" (standalone unit)	Fits into printer's I/O slot	2" x 18.5" x 7" (standalone unit)
Warranty	2 years	2 years	2 years

FAX FEATURES

Group II-compatible	■	■	■
Chip set	Yamaha	Rockwell	Rockwell
Buffer memory	512K	256K	1MB
Number of pages device can store when printer is busy or off-line	30	15-50 (if busy), 8 (if off-line)	60
Automatically changes printer tray for standard or legal-size faxes	☐ (automatically scales legal size down to 8.5" x 11")	☐	■
Fax transmission ability	☐	☐	Optional (\$295)
Battery backup	■	☐	☐

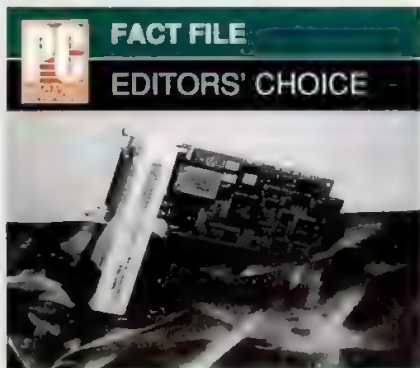
PRINTERS SUPPORTED

HP LaserJet Series II	■	■	■
HP LaserJet IID	■	■	■
HP LaserJet IIP	■	☐	■
HP LaserJet III	■	■	■
HP LaserJet IIID	■	☐	■
Other	Compatibles, HP DeskJet	None	Compatibles

—Editors' Choice ■—Yes ☐—No

THE BEST IMAGES

Besides being simple to install, the product is completely transparent to the user. If the printer is busy when a fax comes in, the FaxConnection will store from 15 to 50 pages in memory before filling its 256K buffer; the number of pages varies with the printer. If you use a LaserJet III, the FaxConnection can move the pages out of its relatively small buffer more efficiently than it can with a II or IID. The complexity of graphics images is also a factor.



FACT FILE

EDITORS' CHOICE

FaxConnection 5011A
Extended Systems Inc., 6123 N. Meeker Ave.,
Boise, ID 83704; 208-322-7575.
List Price: \$595
Requires: HP LaserJet II, IID, or III.
In Short: The FaxConnection 5011A provides fast, high-quality plain-paper fax reception (creating the best images among the three units we reviewed), and because it inserts into the I/O slot on the HP LaserJet printer, it also offers out-of-sight convenience. The price is right, too.

CIRCLE 414 ON READER SERVICE CARD

The FaxConnection gave us the best images among the three products we evaluated. It produced smooth diagonal lines, excellent fine detail, and complete images. We didn't find significant differences in the amount of telephone connect time the various products took to receive the normal fax image; while the JetFax was quickest, the FaxConnection took only 2 seconds longer. And the FaxConnection was quicker than its competitors in accepting a fine-resolution image.

With the FaxConnection, you can choose to receive faxes on legal- or letter-size paper, but the product won't automatically scale a legal-size fax to fit on letter-size paper. Instead, it prints the image on two pages.

THE EXTERNAL OPTION

Although the FaxConnection 5011A operates only inside a LaserJet Series II, IID, or III, an external model—the \$695

FaxConnection 5018A—should be shipping by the time you read this. The FaxConnection 5018A provides external plain-paper fax reception for the same printers, but it also works with compatibles and the LaserJet IID. On the other hand, if you have a compatible printer, you may prefer the FaxConnection 5011A's out-of-sight convenience, along with its ease of installation and lower price.

Extended Systems supplies an adequate instruction manual and a two-year warranty with the FaxConnection 5011A. The product stands out because it's so simple to install and smoothly receives high-quality faxes at competitive speeds. The FaxConnection doesn't support many options. For instance, it won't let you send faxes, as the JetFax does, without purchasing a fax machine or board. But it handily achieves its purpose: letting you receive plain-paper faxes at a low cost and without a hassle.

JETFAX INC.

JetFax

by Lisa Cady Newell

The JetFax, a good-looking and flexible product from JetFax Inc., is a \$995 device that connects to your laser printer to allow you to receive high-quality faxed documents on plain paper. The company (formerly known as Hybrid Fax) also offers *JetFaxPC*, a \$295 software package that lets you send faxes from your PC without installing an internal fax board. Together, the products sell for far less than plain-paper fax machines, although the cost is significantly greater than that of an internal fax board for a PC, which typically lists for under \$500.

The JetFax fits nicely alongside your laser printer. It's as tall and long as an HP LaserJet, but only 2 inches wide. Made of molded beige plastic, it actually looks like an extension of the LaserJet. It uses the Texas Instruments DSP 320-C10 and the Rockwell chip set. Its digital signal processor converts faxes to PCL format.

Users of the HP LaserJet II, IID, or IIP and compatibles can insert an optional raster compression device, the \$155 JetFax Accelerator, into a font cartridge slot to speed up the printing of faxes with dense graphics. Without this cartridge, the printers experience delays of up to several

seconds on graphics files, depending on how complex the images are. The Accelerator is not necessary for HP LaserJet III and IID printers, however, since those particular units already support rasterization.

If you don't purchase *JetFaxPC*, you can dedicate the JetFax to receiving faxes on your LaserJet, while using an existing fax machine to send documents on the same phone line. The JetFax connects to your printer and PC through a parallel port or, on a network, directly to a parallel



FACT FILE

JetFax

JetFax Inc., 978 Hamilton Ct., Menlo Park, CA
94025; 800-753-8329, 415-324-0600
List Price: \$995; *JetFaxPC*, \$295; JetFax
Accelerator, \$155.

Requires: 512K RAM; HP LaserJet II, IID, IIP,
III, IID, or compatible with 1MB of internal
memory free.

In Short: JetFax is a good-looking and wonderfully useful device that fits alongside your laser printer, feeding it incoming fax images for high-quality printing. With *JetFaxPC* running on a PC, you can send faxes out without an internal fax board. The package costs far more than the competition.

CIRCLE 415 ON READER SERVICE CARD

input port on a printer-sharing device. Two RJ-11 jacks on its rear panel accommodate telephones or a fax machine. A hefty power supply is also included. If the printer is busy or turned off when you receive a fax, the JetFax will hold up to 60 pages in its 1MB of memory. It operates at a speed of 9,600 bits per second and allows you to adjust its scaling and copy reduction.

Hardware installation is quite easy. By calling your JetFax from an outside Touch-tone phone line, you activate an interactive voice-response system. After answering, the JetFax prompts for your phone number, the amount of copy reduction desired, and other necessary setup information. You can customize the JetFax by specifying these options from your telephone keypad.

Where can you get every font you'll ever need for your LaserJet III?

Try the Library.

Our Complete Font Library Cartridge™ for the LaserJet III has 51 different typestyles, each scalable to virtually any size, so that you can make your point like never before.

Just as a library has books on every topic, our Complete Font Library Cartridge has a typeface for every kind of document you create. Choose from classic typefaces for proposals, letters, and presentations. Or from designer styles for flyers, invitations and advertising materials.

You see, each of your documents has a different message. And, the way that message is perceived depends greatly on the typeface and point size you choose. A CG Century Schoolbook means business. A CG Bodoni says style. While Cooper Black expresses creativity. Messages like this are difficult to portray on printed pages when you only have access to the one or two typefaces resident in your laser printer.

Our cartridge is unique. In fact, it's unlike any other cartridge for your LaserJet III. That's because our breakthrough windowing technology has allowed us to put what was previously in two separate cartridges, into a single cartridge. The result? Inexpensive and convenient access to every font you'll ever need for your LaserJet III.

For directions to the Library, call your nearest dealer or contact: Pacific Data Products, 9125 Rehco Road, San Diego, CA 92121, (619) 597-4639, Fax (619) 552-0889.



Complete Font Library Cartridge is a trademark of Pacific Data Products, Inc. LaserJet is a registered trademark of Hewlett-Packard Company. Scalable type outlines are licensed from Agfa Corporation. CG Century Schoolbook and CG Bodoni are products of Agfa Corporation. © Copyright 1990 Pacific Data Products, Inc.

AGFA 

PACIFIC
DATA PRODUCTS

WordScan™ The Most Accurate OCR You Can Buy.

And We'll Prove It.

cognition we build into our high-
end systems. Our unique pop-up editor
guarantees the most accurate results
possible. The character is enlarged
to the size of the original document.
Other OCR products. You can even
so it accurately recognizes un-

pop-up

Our unique Pop-up Editor guarantees the most accurate results possible. Proof twice as fast without referring to the original document.

We started with the lowest error-rate OCR technology in the industry. Then we added exclusive features to make WordScan even more accurate. With WordScan you get the same state-of-the-art recognition we build into our high-end systems, at desktop prices.

Exclusive features make WordScan even more accurate.

Our unique *Pop-up Editor* guarantees the most accurate results possible. It pops up an enlarged image of any questionable character or word so you can proof without referring to the original document.

And because WordScan uses dictionaries during recognition, we don't make mistakes common to other OCR products. You can even add your

**"WORDSCAN PLUS
REDEFINES WHAT WE EXPECT
FROM AN OCR PACKAGE. ITS
EXCEPTIONAL ACCURACY, WEALTH
OF FEATURES, AND HANDS-OFF
DESIGN SET A
NEW STANDARD."
—PC MAGAZINE**



own words so WordScan accurately recognizes unusual or specialized terms.

Zap figures or text right from a fax card to your word processor or spreadsheet. No fuzzy print-outs. No retyping. No errors. And only WordScan has built-in dot-matrix support to read even draft quality dot-matrix documents *accurately*. Most OCR products can't do this at all or charge you extra.

Other unique WordScan features get the job done faster, better.

Clipping, another WordScan exclusive, lets you choose just what you want on

the page. Text, image, or both. All in one pass.

Scan Now, Recognize Later lets you scan large documents now, but do OCR later so your PC is not tied up.

Make different documents look the same with our unique *Style Sheet* feature.

Process multiple documents into separate files automatically. Just put a blank page between documents and WordScan does the rest.

We'll send you the proof.

To see the results of head-to-head, real-world comparison tests with the leading competitive OCR software products, or to get the name of a dealer where you can make the comparisons yourself, just give us a call at 800-544-7051.



CALERA
RECOGNITION SYSTEMS

2500 Augustine Drive, Santa Clara, CA 95054 USA. 800-544-7051; outside USA, 408-986-8006; FAX 408-986-1440

© 1990 Calera Recognition Systems, Inc. Calera® is a registered trademark of Calera Recognition Systems, Inc. WordScan and TrueScan are trademarks of Calera Recognition Systems, Inc.

CIRCLE 522 ON READER SERVICE CARD

COMMUNICATIONS

PLAIN-PAPER FAX

SOFTWARE FOR SENDING

You can install the *JetFaxPC* software as a foreground application program or as a TSR module. When running the software in the foreground, you can transmit print attributes such as bold, underline, and other fonts. In memory-resident mode, *JetFaxPC* takes up 150K of RAM and doesn't support print attributes.

We installed the *JetFaxPC* as a foreground application program. This software is menu-driven. Although the documentation gives thorough instructions and

help menus are available by pressing the F1 key, the program's tutorial can help you understand the process better. One problem with *JetFaxPC*: Because you confirm your selections by pressing the Escape key, you may inadvertently send a fax you meant to abort.

JetFaxPC's setup parameters include many convenient features, such as a phone directory that sorts on individual, company, or group names for broadcasting

one fax to a whole group. You can also mail-merge a document to personalize it for each recipient and append your scanned company letterhead and signature. *JetFaxPC* lets you schedule faxing at a later time, poll other fax machines, choose fine versus normal resolution (200 by 196 dots per inch versus 200 by 98 dpi), or preview your fax before sending it. Many of these features surpass those found in the best fax machines available. Once you send your fax, you can monitor transmission activity through log and report files.

The JetFax provided good image quality and minimal transmission times during testing. Although the FaxConnection 5011A produces smoother diagonal lines than the JetFax and carries a significantly lower price, the JetFax offers somewhat more flexibility, including the *JetFaxPC* option. The vendor offers a two-year unlimited warranty.

The JetFax II is scheduled to replace the JetFax in February. It will provide a nickel cadmium battery backup and a copy feature, and it will support additional printers, including the HP DeskJet, DeskJet Plus, and compatibles, and the Canon LBP-8 II and LBP-4.

The JetFax ranks high not only for its ability to receive plain-paper faxes but also for the options its proprietary software offers for sending a fax. After becoming acquainted with the JetFax's plain-paper technology, you may start thinking of the old fax machine in the corner as a modern-day dinosaur.

PERFORMANCE TESTS: PLAIN-PAPER FAX DEVICES

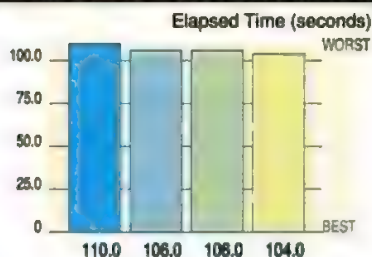
Plain-paper fax devices create excellent images in about the same time it takes a regular fax machine to generate smeared lines on curled paper.

For both tests we used a Dell System 200 equipped with a Hayes JT Fax 4800B. We report the "off-hook" telephone-line time needed to transfer a 1.5-page fax image from this internal fax board to each plain-paper fax device.

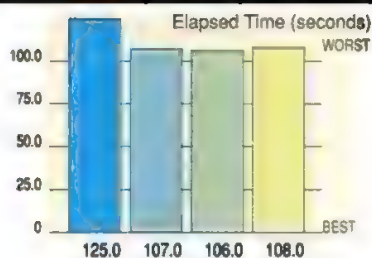
In the **Normal-Resolution Fax Transmission** test, we sent the file at 204 dots per inch horizontally and 98 dpi vertically.

In the **Fine-Resolution Fax Transmission** test, we sent the file at 204 dpi horizontally and 196 dpi vertically.

Normal-Resolution Fax Transmission

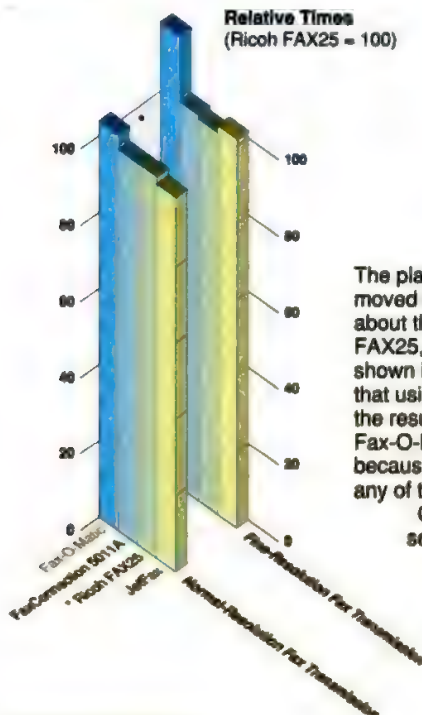


Fine-Resolution Fax Transmission



* Reported for comparison.

Relative Times (Ricoh FAX25 = 100)



* Reported for comparison.

The plain-paper fax products we tested generally moved the fax image across the telephone line in about the same amount of time as the Ricoh FAX25, a conventional desktop fax machine shown in the chart for comparison. The plus is that using the plain-paper devices, you achieve the results without shiny, curly thermal paper. The Fax-O-Matic shows a longer connection time because it consistently took longer to train than any of the other products we evaluated.

Connection time determines the cost of sending a fax and is really the only important measurement. Since some carriers bill for long-distance phone calls at 6-second intervals, small differences in line-holding time can create big differences in costs when multiplied by many calls.

TALL TREE SYSTEMS

Fax-O-Matic

by Sara Parker

Tired of receiving messy, curled-up faxes that you have to spend valuable time manually separating? The Fax-O-Matic, a plain-paper fax device from Tall Tree Systems, presents a small, affordable solution to the problem of untidy and hard-to-read faxes. Priced at \$399, this external device is a bargain for anyone who lacks the card slots, extra memory, or IRQs often required by internal fax adapters that install in a PC. The product does not have the capability to transmit faxes, however.

Like its competition, the Fax-O-Matic receives faxes and prints them out on a laser printer. It works in conjunction with the HP LaserJet II, IIP, III, or compatibles. The Fax-O-Matic is an external device,

486™ 25MHz
\$3,995
Super VGA!

Introducing Windows 3.0 & On-Site Service

486/25MHz Engineering Workstation

- Intel 80486-25MHz CPU
- 4MB RAM
- 256K Cache
- 1.2MB 5.25" drive
- 1.44MB 3.5" drive
- 150MB ESDI or 210MB IDE hard drive
- VGA card w/512K expandable to 1MB
- Name Brand Super VGA color monitor (1024x768)
- 2 serial, 1 parallel & 1 game port
- 101 Key keyboard
- Windows 3.0 & Mouse
- MS-DOS 4.01

\$3,995

**Includes 1yr. TRW
On-Site Service!**



"In terms of general performance, the ACMA is a prince among peers." "...the ACMA 486/25 represents a good value in a top-end machine." *PC Magazine, 9/11/90*



"If you're looking to buy a computer by mail order but still want a company that will stand behind what it sells, the ACMA 386/25 is a good bet." "The Acma stands out for its performance, good expansion possibilities, 45-day money-back guarantee, and two-year warranty." *(November 28, 1989)*



"The Acma 386SX is highly expandable, performs well, and offers a very complete system for an excellent price...Acma offers one of the best service policies in

the mail-order business." "The Acma system not only looks good, it's a good performer...it performed consistently above average." *(May/June 1990)*



"...the machine could reliably handle everything I piled onto it." "The systems from ACMA Computer, Inc. inspire confidence." "Clearly, ACMA intends to be competitive, not only in terms of system bang for the buck, but also in the realm of intangibles like technical support and product warranty." *(April & July 1990)*

386/SX Executive Package

- 386/SX-16MHz System
- 1MB RAM
- Choice of 1.2MB or 1.44MB floppy drive
- 40MB hard drive
- 2 serial, 1 parallel & 1 game port
- Monochrome monitor
- 101 Key keyboard
- Panasonic 1191 printer
- Printer cable
- Printer stand
- Ten diskettes
- Computer paper
- MS-DOS 3.3 or 4.01
- Choice of software
- User's guide
- Surge protector

\$1,995



386/33MHz™ Corp. Workstation

- Intel 80386-33MHz CPU
- 4MB RAM
- 64K Cache
- 1.2MB 5.25" floppy drive
- 1.44MB 3.5" floppy drive
- 105MB IDE hard drive
- VGA card w/512K expandable to 1MB
- Name Brand Super VGA color monitor (1024x768)
- 2 serial, 1 parallel & 1 game port

- 101 Key keyboard
- Windows 3.0 & Mouse
- MS-DOS 4.01

\$2,895

Includes 1yr. TRW On-Site Service!



"The ACMA Corporate Workstation is a solid value with good components." *PC Magazine, 12/25/90*

386/25MHz Business System

- Intel 80386-25MHz CPU
- 4MB RAM
- 64K Cache
- 1.2MB 5.25" floppy drive
- 1.44MB 3.5" floppy drive
- 105MB IDE hard drive
- VGA card w/512K expandable to 1MB
- Name Brand Super VGA color monitor (1024x768)
- 2 serial, 1 parallel & 1 game port

- 101 Key keyboard
- Windows 3.0 & Mouse
- MS-DOS 4.01

\$2,795

Includes 1yr. TRW On-Site Service!



"Our favorite is the ACMA 386/25... an impressive machine." *PC Magazine, 11/28/89*

386/20MHz Pro-System

- Intel 80386-20MHz CPU
- 4MB RAM
- 1.2MB 5.25" floppy drive
- 1.44MB 3.5" floppy drive
- 80MB IDE hard drive
- 16-bit VGA card w/512K
- Name Brand Super VGA color monitor (1024x768)
- 2 serial, 1 parallel & 1 game port

- 101 Key keyboard
- Windows 3.0 & Mouse
- MS-DOS 4.01

\$2,395

Includes 1yr. TRW On-Site Service!



"Choose the ACMA 386/20 for better-than-average construction quality." *PC Magazine, 12/25/89*

EISA 486/25MHz

- Intel 80486/25MHz CPU
- 4MB RAM (expandable to 64MB on motherboard)
- 256K Cache
- 1 2MB 5.25" drive & 1 44MB 3.5" drive
- 150MB ESDI or 210MB IDE hard drive
- VGA card w/512K expandable to 1MB
- Name Brand Super VGA color monitor
- 2 serial, 1 parallel & 1 game port
- Vertical case w/ 250W power supply
- Six drive bays
- 101 Key keyboard
- Windows 3.0 & Mouse
- MS-DOS 4.01

\$5,995

Includes 1yr. TRW On-Site Service!

Order Now 800-456-1818

Hearing Impaired TDD 800-456-8901



CIRCLE 130 ON READER SERVICE CARD

"45-Day Money-Back Guarantee!"

COMPUTERS, INC.™

Acma

All computers are covered by a "two year labor and one year parts warranty and a 45-Day "Money-Back" guarantee. We accept VISA, Master Card, American Express, Discover Card, C.O.D. approved POs, and personal checks (allow 7 days to clear). All prices and specifications are subject to change without notice. Call Acma for current specifications, pricing, payment, shipping, warranty, leasing and return policies. On-site service is available within 100 miles of local TRW service centers. **Call for details and limitations regarding 45-Day Money-Back guarantee. Software, printers, monitors and shipping are not refundable. Non-Acma products are covered by their manufacturers warranty. We are not responsible for errors in typography, photography, or of omission. Acma reserves the right to substitute equivalent parts. Brand names are registered trademarks of their respective companies. Intel, 386, and 486 are registered trademarks of Intel Corporation. Acma Computers Inc., 117 Fourier Ave., Fremont, CA 94539 (415) 623-1212, (415) 623-0618 Fax

about the size of a box of floppy disks. It connects directly to the laser printer through a parallel port.

Internally, the Fax-O-Matic contains two major components, a daughterboard and a motherboard. The daughterboard uses the Yamaha chip set for fax reception, while the motherboard includes a NEC V25 processor to handle the parallel connection to the printer.

EASY INSTALLATION

Installing the device doesn't limit your laser printer to receiving faxes. With your

PC connected to Tall Tree's Fax-O-Matic, you can print local jobs to the laser printer as well (although not at the same time the printer is receiving a fax). Since the Fax-O-Matic does not provide the user with the capability to transmit faxes, you would need a separate fax machine, a PC-based fax card, or one of the many new modems with fax-transmission capability if you wanted to send one.

The Fax-O-Matic's installation process consists of simply connecting the

included telephone cable to a phone jack in the wall, linking a common parallel interface cable between the unit and the laser printer, and plugging the Fax-O-Matic's 9-volt transformer into an electrical outlet. At this point, you should get a blinking signal indicating that all systems are go. No software is required. The entire process takes about 3 minutes of your time.

Setup instructions are on the bottom of the unit, along with a handy diagram showing where the cables connect. If you choose to connect a fax machine or the

TEFAX: The Versatile Do-It-All Faxer

by Sara Parker

The Tefax System Model RA2110 is a versatile performer in the facsimile world. This unit, made by Relisys, cannot send incoming faxes right to a laser printer without operator intervention, so it's not a direct competitor with the other products discussed in this article. Yet the \$1,095 Tefax includes so many other attractive features that anyone interested in faxing through a personal computer should know about it.

The Tefax shares two prominent advantages with the external fax devices we review here: It won't take up an internal PC slot, and it's easy to move from one PC to another. What's more, you can configure the Tefax to act as a telephone, fax modem, line printer, graphics scanner, or copier.

The Tefax looks rather like a regular fax machine. It's about 5 by 13 by 10 inches (HWD), and it includes a telephone handset in a side-mounted cradle. In fact, the Tefax is a regular desktop fax machine, but with an RS-232C port. When connected to a personal computer running either Relisys's DOS-based *Tefaxcom* or Alien Computing's *Microsoft Windows*-based *FAXit for Windows*, the Tefax system gains more functionality than some of the most expensive fax machines and more flexibility than internal fax adapters.

FAX AND PRINTER FUNCTIONALITY

As a standalone fax machine, the Tefax functions adequately, but there are some trade-offs. The trays are a bit cumbersome, and the document feeder holds

Is the Tefax a fax machine, a line printer, or a graphics scanner? Actually, it's all of the above—and more.

only a maximum of five pages for transmission. A drop bin for incoming faxes would be a convenient feature. During our testing, the feeder acted picky about the kinds of paper it would handle correctly; for example, it had problems with thick paper, like the inserts in *PC Magazine*. The machine provides no paper cutter, and its 200-dot-per-inch printer produces crisp but curly copies on common thermal paper. And while the front panel of the machine shows a useful two-line LCD, you can select only a few automatic answer and transmission options from it.

Yet when you connect the Tefax to a PC running one of the two included software packages, it learns tricks usually associated with higher-priced machines, including polling, delayed calling, and selecting numbers from a large directory. Both *Tefaxcom* and *FAXit for Windows* enable you to send and receive faxes from your PC with no paper copy involved, unless you ask for it. You can send incoming faxes to a disk file or have them automatically print out through the thermal printer, or choose both options. You can edit the fax image in the PC and, if you want a plain-paper fax copy, use the software to print it out on an attached laser printer. You can also send outgoing fax images from the

scanner or a disk file to numbers you select from your own telephone directory database.

Since *Tefaxcom* works as a DOS TSR, it allows faxing in the background while you run other programs. The program's main menu offers five pull-down menus with several submenus of their own. For example, after choosing the Receive/Edit option, you can select the Polling feature. This option lets you receive data from remote fax machines that have documents in their feeders, or from files located at remote *Tefaxcom* terminals.

SCANNER AND EDITING FUNCTIONALITY

The Tefax's copy-machine function is similar to the kind found in all fax machines: It simply copies whatever you input to fax paper. But under *Tefaxcom*'s Receive/Mode is the Scan option. This turns the Tefax machine into a high-quality scanner, able to copy input fed into its paper tray to a file stored on disk. The file can then be pasted into other applications, or you can edit the image using either your favorite graphics utility or *Tefaxcom*'s built-in editing capabilities.

Also under the Receive/Mode is the Text Editor option, which enables you to edit your documents before sending

COMMUNICATIONS

PLAIN-PAPER FAX

PC's parallel port to the Fax-O-Matic, you'll find instructions for the additional steps printed there as well. The package also includes an information sheet for supplementary use.

SCALING AND BUFFERING

When it receives a legal-size or longer fax transmittal, the Fax-O-Matic automatically scales the print to fit an 8.5- by 11-inch page (even if there is legal-size paper available in the laser printer; the automatic scaling feature cannot be turned off).

them out. Similarly, the Image View selection on the File Process menu allows you to view and edit either graphics or text data. You can add text to a fax you've received or to an outgoing fax you've created yourself, or cut and paste parts of an image. We liked the wildcard listing of files available through this option; the file you then choose is displayed on-screen, and you instantly enter the edit mode. The File Merge option on the same menu is another nifty feature, allowing you to combine multiple files into one.

WINDOWS FUNCTIONALITY

FAXit for Windows doesn't offer as many options as *Tefaxcom*, but it does work in the *Microsoft Windows* environment. A DOS TSR called SCH.EXE provides a background fax scheduler that lets you receive and send faxes in either the DOS or *Windows* environment. Some available *FAXit* options include fine and standard resolutions (204 by 196 or 204 by 98 dots per inch, respectively) and portrait or landscape orientation on the printer. The supported paper formats range from legal size to DIN B5.

To send text to fax from *Windows* text-editor applications such as *Windows Write* and *Notepad*, you choose the print option in either editor, then press OK, and a *FAXit* dialog menu appears. The menu lets you select destination information from the phone book and also request a time to send the fax. You can schedule an outgoing fax transmission up to 31 days in the future or

The Tall Tree device contains an internal buffer of 512K that will store up to 30 pages in case the printer is busy, turned off, or out of paper when a fax is being received. You can also install an external 6-volt battery to keep the system's memory alive in the event of a power failure; depending on the size and type of battery you use, you can store the contents through long power outages. The pages in memory are printed as soon as the laser printer becomes available.

decide to send the fax immediately.

Neither *Tefaxcom* nor *FAXit for Windows* lets you print plain-paper faxes automatically; instead, you have to direct the software to print your file on an attached printer. Despite this drawback, the *Tefax* system provides flexibility and capability you can't get from many other hardware/software combinations, and it does so at an agreeably reasonable price.



Tefax System Model RA2110
Relisys, 320 S. Milpitas Blvd., Milpitas, CA 95035; 408-945-9000; fax 408-945-0587.
List Price: \$1,095.

Requires: 35K RAM with *FAXit for Windows* 3.0, or 2K RAM with *Tefaxcom*; hard disk, serial port, RS232C cable, DOS 3.0 or later.

In Short: The *Tefax* is a multifunctional fax machine that connects to your PC and provides you with faxing, copying, and scanning capabilities. Its \$1,095 price also gets you options usually associated with higher-priced machines, including polling, delayed calling, and selecting numbers from a large directory.

CIRCLE 417 ON READER SERVICE CARD



FACT FILE



Fax-O-Matic

Tall Tree Systems, 2585 E. Bayshore Rd., Palo Alto, CA 94303; 415-493-1980.

List Price: \$399.

Requires: 256K RAM; HP LaserJet II, IIP, or III, or HP DeskJet or compatible with 256K of internal memory free.

In Short: Fax-O-Matic, the least expensive of the three products reviewed here, is simple to install and use. It prints the roughest diagonal lines in both normal and fine-resolution transmission modes, but received faxes are clear and readable. An external backup battery is valuable for those pesky times when your system goes kaput.

CIRCLE 418 ON READER SERVICE CARD

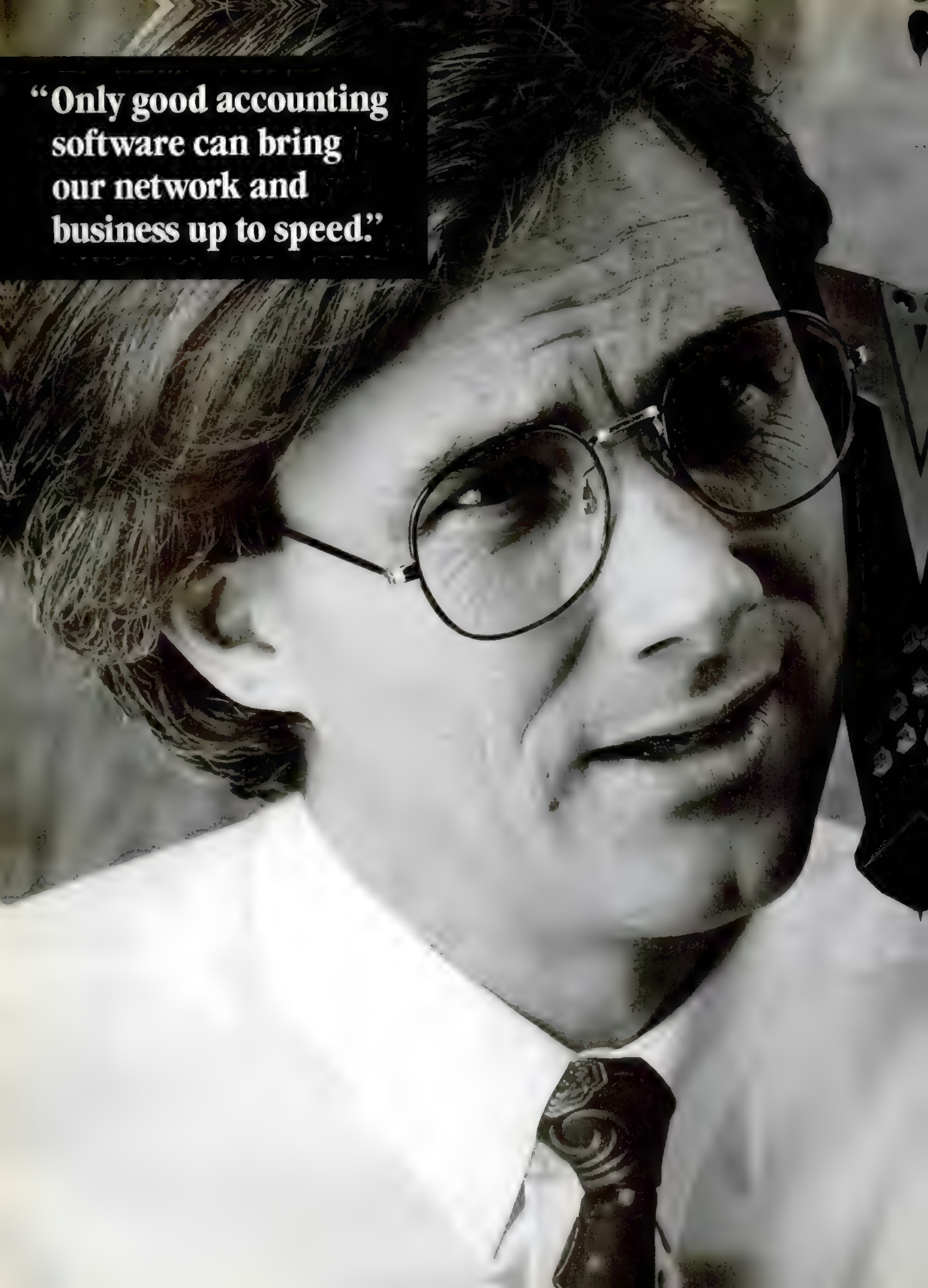
When we tested the Fax-O-Matic, we received generally clear, readable faxes printed at 150 dots per inch. It can't be set as high as the LaserJet's 300-dpi resolution, but even if it could, this setting would slow down the device's print speed considerably.

The Fax-O-Matic was the only device tested to lose a small part of the bottom of an image sent in the fine-resolution transmission mode. Of the three products tested, it printed the roughest-looking diagonal lines in both normal and fine-resolution modes. And our performance tests showed it to be somewhat slower than its counterparts.

Despite these problems, Tall Tree Systems has provided a cost-effective alternative for anyone who hates shiny faxes that are prone to smearing, hard to read and file, and generally a nuisance. The Fax-O-Matic comes with a full two-year parts-and-labor warranty and a 60-day money-back guarantee. It is well worth the investment.

Frank J. Derfler, Jr., is workgroup systems editor of PC Magazine. Lisa Cady Newell has experience in systems integration and customer support for both PC and mainframe systems. Sara Parker is experienced in technical support and user training; she specializes in software systems.

**“Only good accounting
software can bring
our network and
business up to speed.”**



"That's the word from our accounting firm. Most of our PCs are already on a LAN, primarily for office automation. But our departments still aren't working together..."

"Look, you made the LAN investment to improve your office efficiency. Now expand it into a total information system you can profit from."

"Explain."

"You need a LAN accounting system that integrates sales, purchasing and production departments with your accounting department. Then, all your departments can communicate on the same wavelength. You get a teamwork approach that improves financial management, productivity and customer service."

"Any suggestions?"

"Macola. No other accounting software developer has more experience with LANs. Or a better record of performance. Only Macola has earned LAN Magazine's 'Product of the Year' award twice in a row."

"But our needs are unique."

"Nobody offers more customization options... even vertical market solutions than Macola. Like fully integrated systems for distribution. For manufacturing. Plus retail and professional services."

"Is it hard to implement?"

"We did it in phases. Our Macola authorized consultant targeted our immediate needs, then provided training as we implemented each package. The transition was painless. And now, all our departments are working as a team... thanks to Macola on a LAN. I'd go into more detail, but it's seven o'clock."

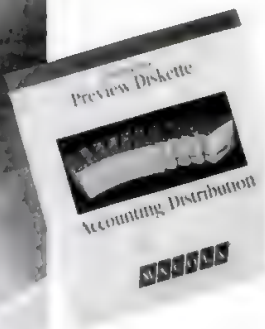
"So?"

"Doing a little 'networking' at the game tonight."

"Thanks a lot."

"Call Macola. They've got the answers you need."

1-800-468-0834 (USA) 1-800-336-8337 (CANADA)



FREE, if you call today!
The Interactive Preview Diskette demonstrates the many advantages and unique vertical market solutions of Macola Software.



MACOLA
SOFTWARE

333 East Center Street P.O. Box 485
Marion, Ohio 43301-0485
614/382-5999

**Accounting Software
You'll Never Outgrow.**

CIRCLE 263 ON READER SERVICE CARD

Choose from 17 integrated packages: **Accounting** — G/L, A/R, A/P, PR, A/D **Distribution** — I/M, COP, P/O, BOMP **Manufacturing** — MRP, M/S, SFC, L/P, SPC, SPR, CRP, J/C, plus Report Writer.

PC Magazine is a publication of Ziff Communications Co. LAN Magazine is a publication of Miller Freeman Publications. Macola is a registered trademark of Macola, Inc. Copyright 1990

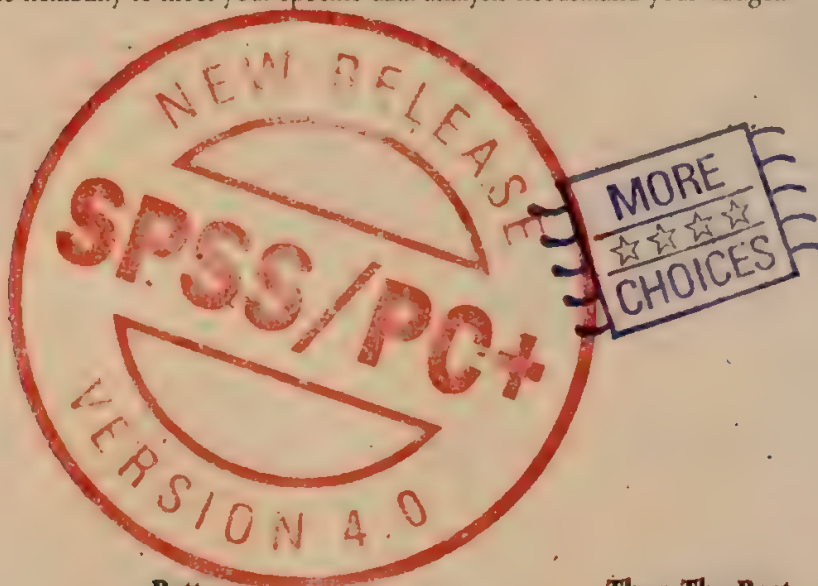
A Welcome Edition.

The most popular PC data analysis package is now even better.

Now when you choose SPSS/PC+™ 4.0, not only do you get the best-selling statistical data analysis software, you get a choice. A choice of the options you need. A choice of the options you want.

Powerful options for data entry, advanced statistics, forecasting, mapping, graphics and more.

Options to help you turn data into information. The newest edition of SPSS/PC+ has the flexibility to meet your specific data analysis needs...and your budget.



SPSS/PC+ 4.0 is...

SPSS/PC+ 4.0 is a fully integrated, sophisticated group of software products designed to handle all your data analysis needs.

SPSS/PC+ allows you to organize, analyze, forecast and display data in countless ways, making it easier to identify patterns and trends that might otherwise go unnoticed. With SPSS/PC+, you gain added insight into the relationships and meaning of your data. And with its graphics and mapping options, SPSS/PC+ provides for a convincing presentation of your conclusions.

Better...

Along with a choice of options, the new SPSS/PC+ 4.0 offers you something more. Like SURVIVAL for life table analysis, PROBIT for expected dosage modeling, and X11ARIMA for smoothed, seasonally adjusted forecasting. And improvements to procedures like REGRESSION and CROSSTABS. Plus, we've updated our Novell® and 3Com® network support and added Banyan VINES.™ SPSS/PC+ 4.0 also supports the latest versions of dBASE®, Excel™ and Lotus®, and by adding Graph-in-the-Box Executive™ and MapInfo™ to our support for Harvard® Graphics and Graph-in-the-Box,® we've created more presentation options than ever before.

Than The Rest.

Whether you only choose the options you need, or choose the options you've always wanted, with the latest edition of SPSS/PC+, you've chosen the best. And if you're in need of a comprehensive package, we offer the widest range of options. Of course, SPSS/PC+ still features a menuing and help system, as well as an on-line statistical glossary to help you interpret results as you go. And you'll always have the training and support you can expect from SPSS, suppliers of statistical software to over 2 million users worldwide.

For more information on SPSS/PC+ call 312-329-3318.

CIRCLE 103 ON READER SERVICE CARD

SPSS

444 North Michigan Avenue, Chicago, Illinois 60611

Financial Modeling Software

The Price Waterhouse Report

by Mike Falkner and Raymond A. August

As the business climate becomes more unpredictable, organizations look for better ways to analyze their performance and plan for the future. Financial modeling packages like *Business Wits*, *Encore Plus*, *Financial Wonder*, and *The Mobley Matrix* present diverse solutions.

America has a love affair with the bottom line. Pass out a financial statement and watch all eyes zoom in on the net income statement. People with real business savvy, however, take a closer look at the information leading to the bottom line to see a more complete picture of the health and wealth of an organization.

Not too long ago, business forecasting and analysis required a minicomputer and a couple of MBAs. Along came the personal computer and simple spreadsheet forecasting, and analysis came to the masses through *VisiCalc* and *Lotus 1-2-3*. Next, products such as *Javelin* were introduced with built-in, business-oriented functions that helped create forecasts.

Other packages followed with templates and models used for plugging in numbers to get your results.

This review focuses on four financial modeling packages ranging in price from \$495 to \$4,995. Three packages, Mobley Matrix International's *The Mobley Matrix*, BrainChild Software's *Financial Wonder*, and Decisus's *Business Wits*, go beyond the spreadsheet model to provide built-in routines that guide you as you build your business model. Ferox Microsystems' *Encore Plus* is basically a financial programmer's toolkit for building models. As you compare the four packages, you'll see that each one attacks business problems in a very different way. *Ronstadt's Financials* from Lord Publishing and *Bottomline V* from ILAR Systems were also requested for evaluation, but neither package arrived in time for testing.

Because these products handle a wide spectrum of business problems with vastly different approaches, we found it more telling to examine how each one handles its particular task than to compare them with each other. We've evaluated the type of financial problem they propose to solve, the ease with which they help you solve it, and usefulness of the results. Then, we take a step back from the package to see if there's another way to solve the problem and how much better or worse that solution would be.

Before we dive into the reviews, let's take a look at what goes into a financial modeling package and what the alternatives to using one are.

PHILOSOPHIES OF FINANCIAL MODELING

Modeling packages take some of the work out of financial analysis by simply asking for information and pumping out reports. With *Financial Wonder*, for example, you store information in predefined or new accounts, apply a formula method such as "grow by x percent," calculate the model, print out one of several canned reports, and you're finished.

Unlike a spreadsheet, however, financial modeling packages often impose a rigid structure to ensure that you get the promised results. You define the reporting periods and enter information into traditional data entry screens. Report layouts are usually predefined, although you can often select ranges to limit the report.

For some modeling packages, financial management isn't just a task, it's a

Modeling packages take the work out of financial analysis by simply asking for information and pumping out reports.

mission. With *The Mobley Matrix*, for example, you get a healthy dose of Lloyd Mobley's philosophy of financial planning and analysis as you work your way through the entry screens, manual, and his book *A Guide to Finance*. If you don't understand the approach, you won't gain the benefit of the information the package creates.

Using an alternative to the popular fill-in-the-blank approach, *Encore Plus* turns you into a business programmer by asking you to build lines of financial code, which

it then compiles into a model. The big advantage of this approach, compared with that of a more traditional package, is that the resulting model is custom-fit to your business. The obvious disadvantage is the steep learning curve (though plain-English programming commands do simplify the process), and in order to design the best models, you need a strong business background.

Although you can build models from scratch with *Business Wits*, its best facility is the comprehensive library of formulas called hyper programs. You select one of these programs for a particular problem, and *Business Wits* presents you with a worksheet form to enter data. While it automates the building of a model by linking the appropriate calculations to the financial problem you define, it also offers the flexibility of powerful graphing capabilities to customize your output. *Business Wits* comes bundled with case studies and tutorials that transform the package into a refresher course in problem-solving techniques used in financial modeling.

If you're eager to put the results of your modeling work into a spreadsheet, you



EDITORS' CHOICE

• Four Good Choices; Choose the Best for Your Business

Once you decide that you can't adequately analyze your business with a traditional spreadsheet and you don't want to look into the capabilities of multidimensional spreadsheets like *Compete* and *TM/1*, you can start to analyze the individual strengths of financial modeling packages. It's up to you to determine the nature of the financial problem you want to tackle and the modeling technique appropriate for your level of experience, and select the package that best suits the way you look at your business.

Business Wits takes some of the apprehension out of financial modeling by incorporating a refresher course on the fundamentals. It includes a fill-in-the-blank format, built-in formulas, predefined reports, and excellent graphing capabilities, making it a package that emphasizes automated analysis.

Encore Plus is a financial

programmer's toolkit, most effectively used by those with a solid business background. If you're technically knowledgeable and comfortable with writing financial code, you can run Monte Carlo simulations, perform risk analysis, and build finely tuned business models.

Financial Wonder's strong suits are calculating financial ratios, generating detailed projections, and evaluating performance relative to competitors. A generous set of built-in routines makes it a useful planning tool for corporate accountants.

The Mobley Matrix provides a unique way of analyzing the fiscal health of a business. If you buy into the unique philosophy behind it, it's a legitimate choice, especially for upper managers who want to look at the big picture and analyze key indicators that foretell the company's financial direction.

can do so. Most vendors are smart enough to give their products the ability to import and export information to .WK1 files. You usually get numbers not formulas in your new spreadsheet, but at least the numbers get there.

Although you may lose some flexibility with a modeling package, you'll gain the speed and accuracy that comes from built-in routines. You need a lot of time, patience, and know-how to create a spreadsheet with the same formulas, financial ratios, and reports that you get with the modeling package. Once you create such a spreadsheet, you've got to spend more time testing the model before you can trust its results.

MODELING IN ACTION

Here's an example of a financial modeling application: Your company wants to buy Company X to make it a subsidiary. You've been asked to analyze the strength of the candidate and how the purchase will affect your company. Using a financial modeling package, you can simply load the financial statements of Company X, print out key ratios, note its strengths and weaknesses, and then forecast the following year of activity and review the key ratios for adverse trends.

To see the effects of the acquisition, load your company's information into a model and do the same analysis. Combine the financial information for both companies and do a third analysis. With predefined formulas, ratios, and reports, you can quickly generate results that you know are accurate.

WHAT ABOUT SPREADSHEETS?

Could you do that with a spreadsheet? Most of us use spreadsheets for one reason or another, and they are powerful tools that can help you work on just about any business problem. If you've ever faced a blank spreadsheet and a short deadline, however, you understand how much planning and work a spreadsheet can require.

That's because a spreadsheet is simply a pile of tools waiting to be used. You can throw information into cells, create convoluted formulas and relationships, and force the spreadsheet to look any way you want it to. You have the ultimate flexibility to make a masterpiece or a mess.

Unfortunately, even with the powerful spreadsheets available today and the dozens of spreadsheet add-in packages that enhance functionality, it takes someone with special talents for financial analysis

and computer wizardry to create a really good financial analysis. After several frustrating hours of building formulas, designing reports, and debugging problems, you'll find yourself longing for a good template that could have freed up time for doing financial analysis.

Yet sometimes a spreadsheet is the only way to get the job done. Let's assume, for example, that you are working on a large development project. Your construction loan has an upper limit so you must kick in new capital when you reach that limit. In addition, when homes are sold, the loan is paid down by the cost of construction, which includes an allocation for interest paid.

Financial modeling packages do poorly

OUR CONTRIBUTORS

Raymond A. August, CPA, is the consulting manager responsible for the New Jersey Price Waterhouse Microcomputer Consulting Group. He is also a member of the Price Waterhouse Open Systems practice and is a frequent contributor to *PC Magazine*.

Graeme Dewar, CA, is a Price Waterhouse manager responsible for the Price Waterhouse Microcomputer Consulting and Support Group in New York City.

Ronald Dobey, CPA, is a Price Waterhouse partner in charge of the Microcomputer Consulting and Support Group in New York City.

Mike Falkner is a California-based microcomputer consultant and a frequent contributor to *PC Magazine*.

Jay P. Hartig, CPA, is a Price Waterhouse audit partner in New Jersey, serving public and private clients.

Stephen Odom, CPA, is a Price Waterhouse audit partner and the partner in charge of New Jersey Microcomputer Consulting Group.

Robert Sullivan is a Price Waterhouse manager in the Chicago-based Information Technology practice. He specializes in database and financial system applications.

when you need numerous IF statements and circular calculations. With IFs, you can easily stop the loan from being paid down too far and quickly come up with the new capital requirements. To determine the pay down per home, you add up the total construction costs over the project and allocate the costs to each home as it sells. That reduces the loan, which reduces the costs, which changes the pay down.

FINANCIAL ANALYSIS PACKAGES

Situated between spreadsheet and modeling packages are ManageWare's *Compete Modeler* and Sinper's *TM/1*, programs that maintain a spreadsheet-style metaphor but add layers of analytic depth. Packages such as these can be grouped together in another category: financial analysis software or multidimensional spreadsheets. *TM/1* is referred to as a relational spreadsheet to highlight its use of data files that are viewed through templates with up to eight dimensions. For details about how packages like these work, see the sidebar "TM/1 and Compete: Far Beyond Spreadsheets."

THE CHOICE

If you think of your financial model as a house, a financial modeling package is similar to a finished home, waiting for someone to use it. An analysis package is a prefabricated home, waiting for someone to put it together and use it. A spreadsheet is simply a pile of lumber waiting for someone to figure out how to build something from it.

When you get down to it, nothing precludes you from using any or all types of financial packages. Your toolkit can include a modeling package for a quick study of financial information, an analysis package for a more flexible, in-depth look at financial information, and a spreadsheet for budgets, simple calculations, or situations that can't be handled by other packages.

Look at your own skills and those of your staff. Even if a spreadsheet gives you all the flexibility you want, you may not have the skills to create a complicated model. On the other hand, you may be a hotshot statistician who has trouble dealing with spreadsheets. In either case, you would benefit from the limited structure and powerful statistical functions of a modeling package.

Don't forget your own philosophy of financial analysis. *The Mobley Matrix* may

look appealing at first glance, but it won't work for you if you prefer to view an organization's details rather than its macroscopic trends.

In fact, of the four packages that we evaluate here, *The Mobley Matrix* is best utilized by upper management to evaluate key indicators of an organization's financial status. *Financial Wonder* functions best when used by corporate accountants who need to develop sophisticated models to plan and forecast a company's future.

Encore Plus has features that appeal to the MIS or accounting department's most technically knowledgeable people to build models and customized financial applications. *Business Wits*' focus on automation of financial scenarios and calculations allows you to concentrate on the concepts and problem-solving techniques inherent in financial modeling.

If you find that you've outgrown the power of your spreadsheet to churn out the financial data you require, it's time to consider firing up a financial modeling package to scrutinize the fiscal health of your business.

Business Wits

by Ronald Dobey

Decisus Software, a division of Xerox, made its debut with *Business Wits* in March, 1990. More than a substitute for a spreadsheet, this \$595 financial modeling package provides clear advantages over spreadsheets for complex modeling situations. It comes with a library of formulas, called hyper programs, that are ready to work on a variety of problems.

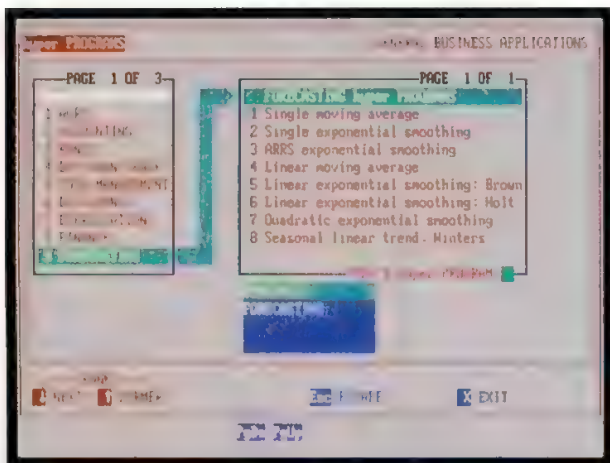
THE FORMULA LIBRARY

Business Wits includes the *General Business Library*, which contains 118 hyper programs that cover 24 categories, including forecasting, loans, present/future value, mortgages, statistics, depreciation, and variance reports. Within these 24 categories are formulas for internal rate of return, linear and quadratic exponential smoothing, economic order quantity, revenue/price elasticity and multiregression fit to name a few. If you simply want to know what your monthly loan payment will be for your car loan, there is a hyper program for that as well.

Decisus provides three optional add-on libraries: Advanced Finance, Banking and Investment, and Statistics and Sampling. Each one costs \$150 and together they provide a total of 237 additional hyper programs.

The main menu of the program is the *Business Wits* Executive. You begin by building a worksheet and linking it to a hyper program. *Business Wits* automates this process for you through the use of its automatic pilot, a series of macros that do the work of some of the more-common operations.

Once the hyper program has been set up, *Business Wits* presents you with a worksheet. Unlike typical spreadsheets, the worksheets are similar to input forms. The forms are much easier to use than spreadsheets, since they don't require you to enter a syntactically correct function command. The *Business Wits* worksheets include data descriptions and on-line help to facilitate the process of entering the required information.



This screen shows the *Business Wits* hyper program menu. The categories are listed on the left, and the programs available within the selected category, in this case forecasting, are on the right.



FACT FILE

Business Wits, Version 1.0

Decisus Inc., 9938 Via Pasar, Suite A, San Diego, CA 92126; 619-530-4803.

List Price: \$595, including *General Business Library*; each add-on library, \$150; complete *General Business Library*, \$285.

Requires: 640K RAM, DOS 3.0 or 3.3 (the program does not support DOS 4.0).

In Short: *Business Wits* is a powerful decision and financial modeling tool that makes the application of quantitative analysis formulas relatively easy.



CIRCLE 407 ON READER SERVICE CARD

The worksheet provides variable names that you can modify and a space for values that you simply fill in. These values are designated as input variables, which you provide, or output variables, which the program calculates. A collection of variables relating to a given hyper program is called a "frame" in *Business Wits* parlance, though it's better to think of it as a database record. There is a limit of 61 frames and 50 variables per frame.

To calculate your monthly car loan payment, you first use the autopilot to select the hyper loan program. *Business Wits* then presents you with a worksheet, and you simply fill in the information concerning the amount of the loan, the term of the loan, and the interest rate in a single frame.

If you want to see what your monthly loan payment would be under different interest rate assumptions, you would create a separate frame for each interest rate. The creation of multiple frames is facilitated by functions that increase or decrease variables over a range of frames. In each frame, the interest rate variable changes while all other input variables remain constant. *Business Wits* then calculates the output variables, and you can view your results on the worksheets, print a report, or graph the results.

GRAPHIC STRENGTH

Business Wits does its best work when given problems that its hyper programs can solve. While using the hyper programs for complex analysis is the most efficient approach, you can also develop programs from scratch. However, a more practical use of this feature is to customize the hyper program output to fit your needs.

The numbers outside.

406TM

386TM

386TM 5x

In addition to the flexibility of modifying the placement of information on reports, there are preset layout specifications that make printing reports easy. Reports can be horizontal, vertical, or statistical. The horizontal report produces rows and columns similar to a spreadsheet. The vertical report looks more like a form with information across the width of the page. The statistical report provides information about the variables; for example, whether they are constants or variables, input or output, and the minimum, maximum, and mean for each one.

One of *Business Wits*' strengths is its graphing capability, which lets you easily create attractive and effective graphs to present your analysis. You can graph multiple variables against other variables, frames, or time. The resulting graph can be further customized to provide the style and colors you prefer.

One of the weak points in *Business Wits* is its lack of file compatibility with other programs. You can import and export spreadsheet information in only ASCII format. Information exported from *Business Wits* to a spreadsheet must be parsed before you can use it in any practical way. The same problem applies to the importation of spreadsheet data. When exporting data from a spreadsheet, you must save it as an ASCII file and then parse the data using the *Business Wits* import facility.

A REFRESHER COURSE, TOO

Business Wits is entirely menu driven, has context-sensitive on-line help, and it comes with clear, easy-to-follow documentation. Decisus pays extra attention to those who need a refresher course on some of the fundamentals. There's an

extensive reference, bibliography, and a short back-to-the-basics section covering net present value concepts. There are also on-line tutorials and a separate manual devoted to exercises and case studies. The on-line tutorials are useful, and unfortunately, a source of frustration. Once you begin a tutorial, you can move forward only one screen at a time. If you need to exit one of the tutorial modules before completion, you cannot return later to the place you left off. This would normally be a minor annoyance, but *Business Wits*' tutorials consist of 13 modules, each one running about 30 minutes.

In some respects, using *Business Wits* is like having a staff of number crunchers on hand. The hyper programs allow you to concentrate on concepts and problem solving without worrying about the calculations. However, you must understand the formulas you are applying since *Business Wits* cannot ensure that you have selected the appropriate formula for the problem at hand or that you have entered the correct information as input variables.

Business Wits is a comprehensive decision-support package that can assist you in analysis and evaluation of financial data. It won't interpret the results of calculations or make decisions for you, but it does improve the reliability of microcomputer-based quantitative analysis and open the door to those who find financial modeling intimidating. *Business Wits* makes the application of sophisticated formulas relatively easy, so you can apply quantitative analysis techniques to problems in ways you wouldn't have thought possible.

Encore Plus

by Graeme Dewar

It's more appropriate to think of *Encore Plus* as a programming language that can be used to create financial models rather than as a financial modeling package. Ferox Microsystems positions this \$895 package to appeal to two types of users: the spreadsheet user who needs a more-powerful product, and users of mainframe financial modeling software who want to move applications onto the desktop without sacrificing mainframe capabilities.



FACT FILE

Encore Plus, Version 1.5

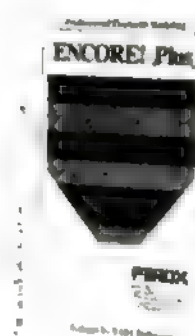
Ferox Microsystems
Inc., 901 North
Washington St., #204,
Alexandria, VA 22314;
703-684-1660.

List Price: \$895.

Requires: 320K RAM,
DOS 2.0 or later.

In Short: *Encore Plus*

is a versatile modeling package that should appeal to people with an interest in programming. It doesn't rate well in simplicity, but those who persevere will be rewarded with models perfectly suited to their businesses.



CIRCLE 408 ON READER SERVICE CARD

Encore Plus is useful to people who need to develop customized or complex applications that go beyond the scope of spreadsheets.

A MODEL IN THREE STEPS

Encore Plus is an intimidating package at first, since it requires that you learn Exec, Encore's programming language. This language has over 300 programming commands and functions with the capability to perform powerful data analysis and manipulation.

Developing a model in *Encore Plus* is a three-step process. You start by using either *Encore Plus*'s editor or your own word processor to develop a model in the form of a logic file. This file is then checked for syntax errors and compiled into *Encore Plus*'s pseudo-code to produce an executable file. The data is then added directly into the logic file, by entering it into *Encore Plus*'s spreadsheet, or by importing it from either *Lotus 1-2-3* (.WKS and .WK1 formats), comma-delimited ASCII, or plain text file. The benefit of separating the program from

Report Company Utilities Rep-Period Time-Period Print Comment ? Quit				
Page-Up Runy International AF191EIS(3)				
Report Period: February, 1991 Time Period: No				
	Current	Budget	Var %	
Profit & Loss Summary:				
Sales Revenue	3,990,284	3,272,644		
Gross Margin %	68.6%	69%		
Gross Profit	2,125,546	2,283,700		
Operating Expenses	1,553,481	1,555,911		
Depreciation	291,859	274,89		
Operating Income	281,006	352,90		
Net Income After Taxes	112,283	155,00		
Return on Sales	3.6%	4.7% (23.6)%	6.1%	(40.8)%
Return on Equity	11.6%	16.8% (27.2)%	24.1%	(51.7)%
Return on Assets	5.7%	7.9% (28.3)%	10.5%	(45.9)%
Head Count	355.0	357.8 (0.6)	329.5	7.7

Drill Down	
Go Back Up	1.8%
Forecast	(2.0)%
Logic	
Company Comparison	(1.0)%
Display Commentary	0.7%
Enter Commentary	11.2%
Remove Commentary	
Show Full Row Name	(22.9)%
(Never Mind)	(40.2)%

Refresh: 6.9 seconds

Encore Plus allows for the development of custom financial applications, including executive information systems like the one pictured here.



The computer inside.

Since buying a computer today is such a numbers game, here's a simple rule of thumb. Look for 386™ SX, 386™ or 486™ on the outside to be certain that you have Intel technology on the inside. From the company that invented the microprocessor. The company that has shipped over 10 million 32-bit processors. The same company that's investing over \$1 billion this year

to make sure the computer inside your computer has the technology, power and compatibility to take you into the future.

intel®

The Computer Inside.

©1990 Intel Corporation.

386 SX, 386 & 486 are trademarks of Intel Corporation.

CIRCLE 512 ON READER SERVICE CARD

the data in this fashion is that it makes the program readily usable over many different sets of data.

PROGRAMMING IN ENGLISH

Encore Plus's programming language uses plain-English commands; for example, 'Total Expenses'='Salaries' SUM 'Misc Expenses.' This line means that total expenses equal the sum of the contents of all of the rows between salaries and miscellaneous expenses for each of the columns in the model. Defining formulas with these commands produces models that are easier to understand than corre-

sponding formulas in a spreadsheet would be, since spreadsheets rely on cell references to identify the numbers to be acted upon.

Using field names instead of cell addresses in formulas has the added advantage of limiting the possibility of errors. You can get the same result using range names in *Lotus 1-2-3*, but only with the extra step of creating the named ranges first. You'll find that overall, *Encore Plus's* English statements are easier to work with than other packages reviewed here.

MONTE CARLO SIMULATIONS

Encore Plus's analytic functions include matrix mathematics that can perform financial statement consolidations, currency conversions, what-if analysis, net present value, internal rate of return, and depreciation functions. The financial forecasting functions allow you to use complex forecasting formulas such as exponential smoothing and Winters method (a forecasting approach for seasonal businesses) to develop complex financial forecasts.

Encore Plus also has strong risk-analysis features, including the ability to run Monte Carlo simulations. This technique

TM/1 AND COMPETE: Far Beyond Spreadsheets

by Robert Sullivan

Researching currently available software packages that perform high-level financial analysis is enough to make anyone's head spin. What was once a fairly straightforward proposition—learn *Lotus 1-2-3* and wait for upgrades—now entails choosing from a dizzying array of possibilities and posing deep metaphysical questions: What is the nature of true multidimensionality and how does it differ from imitations? Is our way of thinking so deeply entrenched in the two-dimensional spreadsheet metaphor that its format determines how we structure our business analysis rather than vice versa? No wonder so many users take one look at the situation and scurry straight back to the comfort of their familiar, often inadequate, rows and columns.

Nonetheless, a little perseverance makes two points clear. First, the traditional complaints hurled at the standard spreadsheet model, such as inefficient decisions being made due to lack of control and data redundancy, remain valid despite improvements in new releases. Second, there are products currently on the market that address these concerns and do so with considerable creativity. If you face complicated business models that traditional spreadsheets handle clumsily—if at all—yet prefer to stick with the familiar spreadsheet approach, you may want to consider some of the alternatives like

TM/1 and Compete Modeler.

Sinper Corp.'s \$795 *TM/1*, Release 4.0, falls into the category of relational spreadsheets, meaning that it incorporates the features of a relational database and a standard spreadsheet. You enter and maintain information in a central database that generates all related spreadsheets. This configuration eliminates inefficient, redundant data entry. More importantly, it ensures a higher degree

geographical regions. Defining dimensions up front has definite advantages: you label data by name rather than by cell address, and by centrally defining consolidations and formulas, you eliminate the need for spreadsheet macros and formulas.

You can then use your established dimensions to define tables into which you enter the actual data. The tables in *TM/1* use any combination of dimen-

sions, so you can create a table showing sales for all months across all regions, or you might want to see all accounts across all months for a single region. Switching perspectives on the tabular data is fast and simple.

Once a given table is in the desired format, you can generate a spreadsheet. In this relational spreadsheet world, the spreadsheet really functions as a template or report generator for the tabular data. It is used to tweak the data and produce reports, but it doesn't store anything except its own structure. In addition to saving storage space, this feature allows *TM/1* to handle large models extremely well without sacrificing response time.

Other attractive features in *TM/1* include very strong import capabilities, an excellent user's manual and tutorial, and multiuser LAN functionality (with the purchase of the \$995 Spreadsheet Connector software, which makes *TM/1* databases directly accessible to *Lotus*

Compete, which runs under *Microsoft Windows 3.0*, takes advantage of the graphical interface by letting you examine different aspects of your data simultaneously.

of data integrity since multiple spreadsheets have access to the same consistent data at all times.

TM/1 is also true multidimensional software. You begin by specifying up to eight dimensions, including any consolidations and calculations they may contain. Typical dimensions might include a chart of accounts, the month, and

SOFTWARE

FINANCIAL MODELING

is most commonly used to evaluate alternative investment opportunities assuming that, given equal returns, you will choose the investment involving the least amount of risk. To measure the risk and uncertainty of capital investments, the Monte Carlo technique assigns ranges to key assumptions in a model instead of single point estimates. The model is then run repeatedly using randomly chosen variables from within each of the ranges of the key assumptions to produce a distribution of results.

In addition to creating financial models with *Encore Plus*, you can use the

package to build an executive information system (EIS). Once you develop the programming talent necessary to set one up, you may want to buy the EIS toolkit from Ferox that includes an EIS application you can use to modify to your needs.

SIGNS OF AGING

Graphics is the one area where *Encore Plus* tends to show its age. Originally written in 1983, and only functionally upgraded since then, it doesn't take advantage of VGA resolution or high-quality

output devices such as laser printers. (You can print *Encore Plus* reports and graphs on laser printers using the third-party add-on, *Print-a-Plot*, which converts plotter commands into laser printer commands.) An upgrade to support graphics is long overdue.

The package does include a graphics function that readily graphs the results of any model and supports basic line and bar graphs, as well as floating bar and Gantt charts. With the Reports function, you can customize the appearance of the charts to produce the best possible results.

Encore Plus's documentation is complete and easy to follow. There are five manuals in all, including a quick-start guide and a programming reference containing an example of each programming command.

Encore Plus should appeal to financial analysts who feel comfortable with programming languages and to spreadsheet users inhibited by the macro languages of those products. The relatively high price should also keep the package out of the hands of the casual user. *Encore Plus* doesn't have the flash of some of the other packages reviewed here, and compared with a spreadsheet package, it is significantly harder to learn. The time you invest, however, will be rewarded by fewer programming errors and greater flexibility in constructing complex models.

1-2-3 users across a LAN). Some of the drawbacks include uninspired and limited graphics capability that power users will want to consider before investing.

MANAGEWARE'S COMPETE

Although ManageWare's *Compete Modeler* promotes itself as a decision support system, it has many features in common with *TM/1*. Truly multidimensional, it allows up to 12 dimensions per model and provides easy automatic viewing of data in different combinations of dimensions. The package also reduces complexity and redundancy through a single centralized data source, globally defined formulas, and object-oriented approach.

Unlike *TM/1*, *Compete* runs under *Microsoft Windows 3.0*, allowing switches among the various data dimensions with the motions of a mouse. Users familiar with *Microsoft Excel* will have an edge in learning *Compete*, since the two packages share the identical format of pull-down menus.

Compete's strength lies in its support of high-level functions for sophisticated financial analysis and its wide range of powerful built-in tools. For example, you can integrate cost drivers into models to automatically calculate relationships such as scale, experience, complexity, utilization, double cost, and S-curves. To apply a growth rate to your data, you would select from such forecasting techniques as interpolation and regression.

As for sensitivity analysis, *Compete* not only lets you examine how changes

in entered values would affect the calculated values that depend on them, but it also lets you set a goal for a calculated value and determine how to change components to attain the goal.

Compete's drawbacks include the lack of graphics capability, which you can circumvent by establishing a hot link to *Excel*. It cannot function in a multiuser environment, and you need a security key on your PC's parallel port to run the complete copy-protected software. And the \$4,995 price is steep. A very basic \$495 version of *Compete* allows viewing in 12 dimensions but has no modeling functionality or business planning tools.

If you're resigned to the limitations of your current spreadsheet, *TM/1* and *Compete* show that it may pay to shake off complacency and take a look at what the market has to offer. ■

Compete Modeler, Version 4.1

ManageWare Inc., 100 First Stamford Pl., Stamford, CT 06092; 203-359-9397.

List Price: \$4,995; basic viewer, \$495. **Requires:** 640K RAM, *Microsoft Windows 3.0*, DOS 3.1 or later.

CIRCLE 411 ON READER SERVICE CARD

TM/1, Release 4.0

Sinper Corp., 31 Mountain Blvd., Warren, NJ 07060; 800-822-1596; 201-755-9880.

List Price: \$795; *Spreadsheet Connector*, \$995. **Requires:** 320K RAM, DOS 2.2 or later.

CIRCLE 412 ON READER SERVICE CARD

Financial Wonder

by Stephen Odom

Corporate budget and finance analysts who insist on concise budgeting into the future will appreciate *Financial Wonder*. This \$495 modeling package from Brain-Child Software provides 650 financial accounts, 94 formula methods, advanced calculations and allocations of financial amounts, functions to adjust for seasonality, and the ability to compare output with benchmark test ratios.

Financial Wonder is reminiscent of the older software generation that enforced copy protection. Access is limited by the use of a key that attaches to your computer's hardware port. It does not hinder data backup.

PROJECTING ACCOUNTS

The financial projection base template has approximately 250 predefined accounts. These accounts are not very flexible since you can change only the ac-

SOFTWARE FINANCIAL MODELING

count descriptions and not the account numbers. There are also approximately 400 subaccounts that may be added to any predefined account.

Financial Wonder utilizes two screens: the data entry screen for annual dollars, percentages, or the number of days outstanding, and the formula screen for de-

STRONG SUITS

Financial Wonder incorporates ten seasonality calculations, useful for businesses whose activity surges during certain periods of the year: a retailer during November and December, or an ice cream store

sideration. By flagging accounts, you can prepare projections to determine the impact on cash flow or net income given the addition or removal of a particular product line or other discrete business unit. While clumsy, this flagging feature is the only way to print financial statements for a single department or subaccount. A preferred approach would be to simply request the printing of a statement for a particular subaccount.

The preparation of financial ratio analysis is a *Financial Wonder* strong suit; the package is capable of calculating more than 20 ratios. The flexible ratio feature is also capable of calculating more than 20 ratios and allows you to designate certain parameters and variables for the ratio calculation. The package uses five different ratio benchmark tests for comparison. This feature is a useful tool for evaluating an organization's financial performance relative to its industry competitors.

CASH FLOW STATEMENTS

Although *Financial Wonder* may be an excellent tool for certain corporate budgeting and analysis, the software is substantially limited by its three-year projection limit. In the case of mergers, acquisitions, business plans, and other financial analyses, projections in excess of three years are often prepared or required by potential investors. In many real estate projections, required projection periods may exceed 25 years.

The cash flow statement is prepared in a format complying with Financial Accounting Standard No. 95 under generally accepted accounting principles. This feature could be utilized by CPAs to help clients prepare their annual financial statements.

Calculated increases and decreases in cash flow are automatically recorded as increases in marketable securities or additional loans. These accounts are specifically used to accumulate excess or deficient cash flows. Properly configured, *Financial Wonder* will calculate interest income and interest expense on excess and deficient cash flows, respectively. The software will also calculate the net present value of monthly cash flows to assist in business valuation. This feature, however, has limited utility due to the three-year projection limitation.

IMPROVEMENTS IN THE WORKS

You can export your financial projections to *Lotus 1-2-3* files. The package not only

Calculate	Screens	Printout	Reports	Files	Quit/DOS
Ratio Sensitivity Range	EXCL	GOOD	AVERAGE	POOR	WEAK
1 Gross Profit Margin	50.00%	45.00%	40.00%	35.00%	30.00%
2 Operating Profit Margin	20.00%	15.00%	10.00%	5.00%	0.00%
3 Net Profit Margin	15.00%	12.00%	8.00%	4.00%	2.00%
4 Return on Investment	10.00%	8.00%	6.00%	4.00%	2.00%
5 Return on Equity	20.00%	15.00%	10.00%	8.00%	6.00%
6 Return on Capital Employed	20.00%	15.00%	10.00%	8.00%	6.00%
7 Earnings Per Share	5.00	4.00	3.00	2.00	1.00
8 Quick Ratio	2.00	1.50	1.00	0.75	0.50
9 Current Ratio	2.50	2.00	1.50	1.00	0.75
10 Debt Ratio	75.00%	60.00%	50.00%	30.00%	10.00%
11 Debt-Equity Ratio	75.00%	60.00%	50.00%	30.00%	10.00%
12 Debt-Capital Ratio	75.00%	60.00%	50.00%	30.00%	10.00%
13 Equity Ratio	10.00%	30.00%	50.00%	60.00%	75.00%
14 Times Interest Earned	5.00	4.00	3.00	2.00	1.00

Financial Wonder can track numerous financial ratios. These ratios can be compared with five different benchmark tests that show your company's performance in relation to its key goals.

fining a formula for each predefined account and subaccount. From the formula screen, you can calculate monthly or quarterly amounts and vary formulas on individual accounts from one period to the next. With some of the more-complex formulas, you can link virtually any number of accounts to calculate, for example, cost of sales as a percentage of sales.

The package comes with a set of formulas that perform the most sophisticated interest expense and interest assumption calculations. You can base accounts receivable on a specific number of days' sales, base accounts payable on a number of days' cost of sales, and base inventory on the number of days of purchases on hand.

For this particular set of formulas the data screen entry would be the applicable number of days. Utilizing the same formula, you can change the number of days outstanding from period to period. Formulas also allow for monthly compounding and geometric progression of financial amounts, which is helpful in projecting revenues and expenses.

Once you get the formulas and data entered, *Financial Wonder* quickly prepares balance sheets, income statements, and cash flow statements on monthly, quarterly, and yearly bases.

during the summer months. Monthly financial amounts are calculated by the season, allocating 100 percent of the projected annual amount on a percentage basis for each month. You can apply different seasonal templates to any account from one period to the next.

With subaccounts you can create detailed projections for various product lines or numerous locations, or allocate cost of sales between fixed and variable costs. Although you can't delete the preconfigured accounts, the *Financial Wonder* program lets you flag accounts to temporarily eliminate them from projection con-



Financial Wonder, Version 1.6

BrainChild Software Inc., 2 Thomas Lane, Plainview, NY 11803; 516-822-1132.

List Price: \$495.

Requires: 640K RAM, DOS 3.1 or later.

In Short: *Financial Wonder* is

sophisticated projection software that produces results exportable to *Lotus 1-2-3*. It's a strong developing tool for the complex structures of individual companies with less than four years of projections. Copy protected.

CIRCLE 409 ON READER SERVICE CARD



ZEOS[®]
Simply the best
notebook you
can buy.

Take it from the experts:



A few expert opinions:

"There's a new king of the hill—the ZEOS Notebook..." — **PC Magazine** ■

"This notebook is a

steal." — **InfoWorld** ■ *"In this category I'm most*

impressed with the ZEOS Notebook...it has to be

the number one contender." — **John C. Dvorak**

■ *"The best price performer in its category."*

— **Mobile Office** ■ *"An outstanding value."*

— **PC Week** ■ *"Impressive"* — **PC Sources**

Impressive Indeed!

And The Price?

t and ded.

our light weight snap-in, snap-out battery packs. They're so light and easy to use, you can easily take an extra one with you on those really long trips. You can get even more life out of a single charge by using our programmable power management system. Hour upon hour of Notebook computing power!

CONNECTIVITY TOOL

Your new ZEOS notebook is a great connectivity tool. Utilizing our optional built-in 2400 baud MNP Class 5 modem, connectivity buffs will find themselves

logging on at every turn. And speaking of connectivity, we've kept the I/O easy to use too. Because unlike many of the others, your new ZEOS notebook has the same industry standard port connectors you'll find on your larger desktop system. Completely compatible! Serial and Parallel ports; even an external VGA connector. All industry standard and ready to go the minute you receive your system.

It's attention to detail that makes the difference. Tens of thousands of hours of development time have been invested. We've been thinking and re-thinking exactly what you want in a notebook, and now we're building it for you. We think you'll agree, it's an incredible product. Plus, your new notebook is backed by the best support in the industry, 24 Hours a Day.

\$1995!

ZEOS 24 HOUR A DAY SUPPORT.

After all, it was ZEOS that invented 24 Hour a Day Toll Free Sales and Technical Support. We're always here to help. Any time you need us your telephone is a Toll Free Hotline—direct to your own personal Technician. 24 Hours a Day, 365 Days a Year. Now that's ZEOS value. But we don't stop there either.

Your new notebook is also backed by our 30 Day Absolute Satisfaction Money Back Guarantee and One Full Year Limited Warranty. You're going to be very satisfied. We don't just say it. *We Guarantee It.*

ORDER YOUR OWN ZEOS NOTEBOOK NOW!

You can order your new ZEOS notebook *right now*. Simply pick up the phone and give us a call now at 800-423-5891. At last, a full featured notebook that lets you compute anywhere. You're going to love it. That's a guarantee!

**ORDER NOW TOLL FREE:
800-423-5891**

**Take desktop
power anywhere!
ZEOS Notebook.**



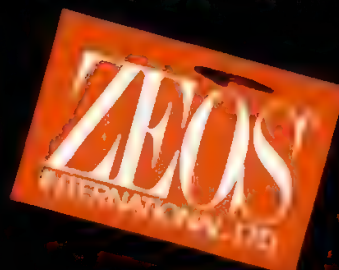
**NOW. YOUR COMPLETE
'286 NOTEBOOK! VGA,
20MB HARD DRIVE, 1.44MB
FLOPPY AND MORE. LIGHT
AND LOADED! INCREDIBLE.**

**ONLY \$1995
386SX ONLY \$2295!**

- Genuine Intel® 80286-12 or 386SX-16 CPU.
- 1MB DRAM, expandable to 3 or 5MB.
- 20MB High Speed HDD.
- Built in High Density 3.5" 1.44MB floppy drive.
- High Resolution VGA display. Fluorescent backlit 640x480, 32 grey scales. Bright and clear!
- Removable quick charge NiCad battery. Two hour plus battery life typical, more using Programmable Power Management!
- Quick charge or trickle charge using included AC power adapter.
- Extra battery packs and external charging stand available.
- 82 key keyboard. True 101 key emulation.
- Industry standard Serial and Parallel Ports.
- VGA port for external VGA color display. Great for demos!
- Total system weight under seven pounds with battery!
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

**ORDER NOW TOLL FREE:
800-423-5891**

FAX Orders: 612-633-1325
Minnesota: 612-633-4591
Hearing Impaired (TDD)
Orders: 800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, VISA, Am Exp.
Z-CARD and COD
Open 24 Hours a Day,
365 Days a year!



The ZEOS Guide to the Perfect Notebook:

 **PROCESSOR:** PC Magazine recommends a '286 or '386SX processor pointing out that "8086- and 8088-based portables have only half to a third of the computing power of a 286." That's why ZEOS offers you your choice, '286 or 386SX! More power for you. After all it's just like a 6.5 pound desktop!

 **DRIVES:** *Two drives, built in!* A whisper quiet high speed 20 Megabyte hard disk *plus* a 1.44 Megabyte 3.5 inch floppy. Remember, with a built in floppy drive you don't need to fool around with strange interfaces to load and transfer files.

 **VIDEO:** ZEOS raises the ante to VGA! We're talking about bright and crisp VGA displayed on one of the largest notebook screens in the industry. The display also features advanced fluorescent backlighting, 32 grey scales and 640 x 480 resolution. Plus, it can be adjusted to any position over a 135° angle and features easily adjustable brightness and contrast controls. Easy viewing under virtually any lighting conditions. You can connect to an external VGA color monitor too!

 **GREAT BATTERY FEATURES:** Every battery feature you want. You can plug your notebook in and "quick charge" the battery in less than one hour or you can "trickle charge" while in use. Plus, your battery easily snaps out allowing the quick installation of an optional replacement battery. It's great to be able to carry a light weight spare for those especially long trips. An optional battery charger stand is available as well.

 **INTELLIGENT POWER MANAGEMENT:** Your new ZEOS notebook features an intelligent programmable power management system if you wish to use it. Based on the length of time since your last keystroke, you may reduce CPU speed, display screen backlighting etc. Full power is immediately restored at the stroke of any key. The system even knows *not* to use the power management system when you are operating on AC power!

 **SYSTEMS STATUS AT A GLANCE:** Yes, monitor eight key system components at a glance! We've equipped your new notebook with eight LED indicators which monitor disk access, keyboard functions and power status. There is even an audible alarm

which may be programmed to inform you of a low battery condition and to let you know if the cover is closed with the power on. Now that's one smart notebook!

 **DESKTOP KEYBOARD FEATURES:** We're talking 82 full size keys with full 101-key emulation. And the keyboard isn't squeezed either. The distance between the "Q" key and the "[" (left bracket) key measures 7.5 inches, just as PC Magazine suggests. The keys are of standard size, plus touch typists will love our full 3.5mm keystroke. Type for hours and love it!

 **CONNECTIVITY AND I/O:** Keeping in touch is easy when you order our internal 2400 baud MNP Class 5 modem. Simply plug in the phone line and dial away. How about I/O ports? Many notebooks don't have them and if they do they're often non-standard. But your ZEOS notebook has *industry standard* I/O—serial, parallel and VGA. Just like your desktop!

 **FCC & UL APPROVALS:** Your new ZEOS notebook features both FCC Class B and UL approvals. We've also met CSA and VDE requirements too, just for good measure. Quality and reliability.

 **WATCH THE DETAILS TOO:** Like memory expandability. One Meg comes standard, you can also order a total of 3 or 5MB as a factory option. And lots of other details. Like a recessed power-on reset button, a soft carrying handle, built in speaker and more. You're going to love it! And there's no reason to wait.

CALL NOW TOLL-FREE:

800-423-5891

CHECK IT OUT!

Now, you can take desktop computing power anywhere! Your ZEOS notebook has many features of obvious importance. Also, there are a number of features that are subtle yet critical to your ultimate satisfaction. We'll go over them here one by one. We think you'll agree your new ZEOS Notebook is the one for you!

Your New ZEOS Notebook.
Take your pick!

As a '286
Only \$1995!

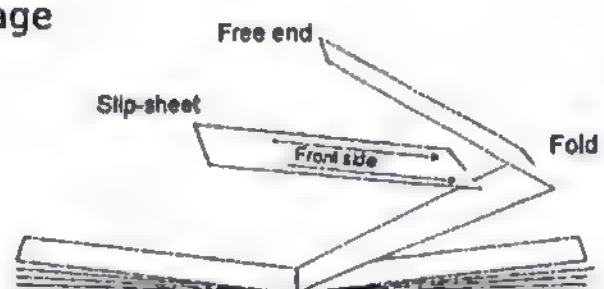
As a '386SX
Only \$2295!

80286 or 80386SX, Hard Drive, Floppy Drive,
VGA, Under 7 lbs., Beautiful!

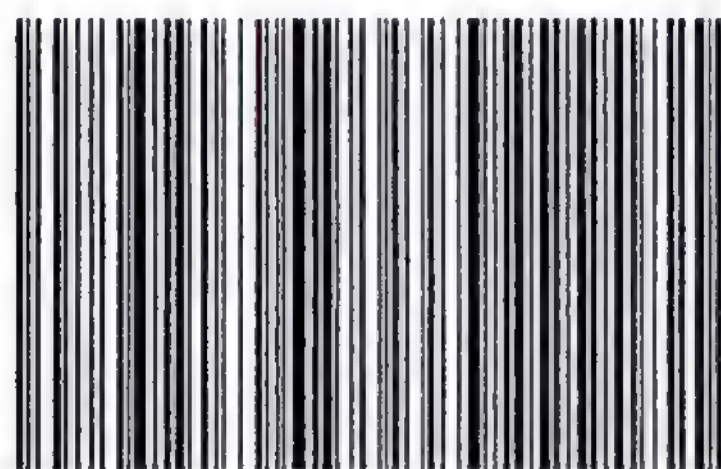
Unbelievable.
Believe It!

Call Now!
800-423-5891

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

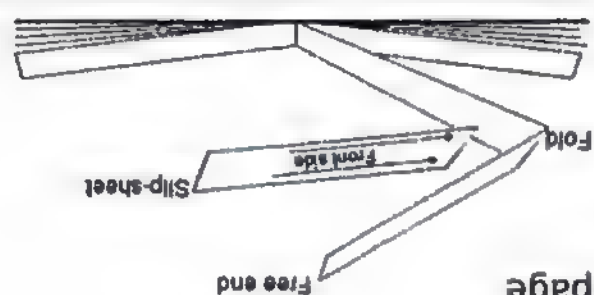


GbsSlipSheet-001

Inverted Foldout slip-sheet

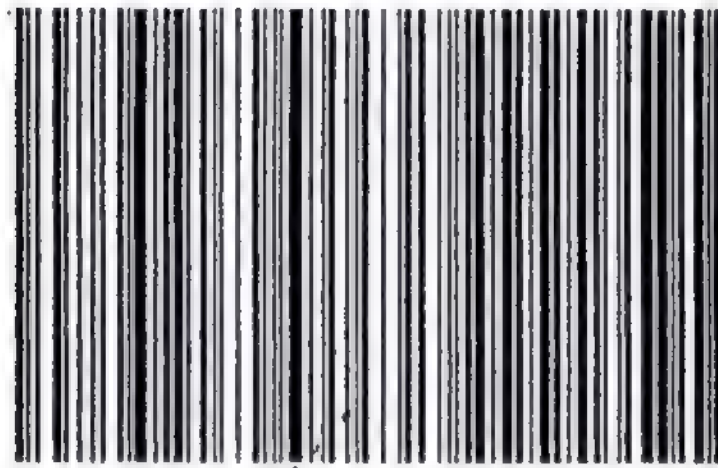
Folded edge of the page

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side

"THERE'S A NEW KING OF THE HILL"**—PC MAGAZINE**

"King of the Hill... Impressive... The best price-performer... An outstanding value... A steal... The number one contender..." We couldn't have said it better ourselves. The experts love the new ZEOS Notebook. And you will too. At only \$1995 for our '286 version and \$2295 for our new 386SX, you simply can't find a better notebook anywhere!

As PC Magazine said, the ZEOS Notebook "offers a top notch combination of power, weight, features and price..." And you can pick your power! Choose our '286 version or go for the incredible new ZEOS '386SX. Combine either with our high speed hard disk, built in 1.44MB floppy drive, VGA and more—you've got the greatest notebook going at any price!

INCREDIBLE DESKTOP FEATURES IN A NOTEBOOK.

In fact, it's really like owning a 6.5 pound desktop that you can take with you anywhere! Look closely at the details. Like our crisp 10" VGA display. The ultimate in sparkling clarity, it features advanced fluorescent backlighting for vivid VGA graphics. Then, the drives.

Two drives are better than one! First, your notebook will include our whisper quiet high speed, high capacity hard disk. It will read and write your data so fast chances are you'll hardly know it's there. Then we're building in an industry standard 1.44 Megabyte 3.5 inch floppy as well.

While most notebooks don't include a floppy drive at all, you're really going to appreciate your ZEOS notebook's industry standard 3.5" floppy. It makes loading software and transferring files a breeze. Simply toss in your 1.44 and it's done. Anyway, can you imagine a desktop system without a floppy? We couldn't either. That's why your ZEOS notebook has one. It's great!

But the features of your incredible new ZEOS Notebook don't just stop there. Detail after detail we're giving you more than anyone else. Much more, for much less. Take a closer look.

DETAILS MAKE THE DIFFERENCE!

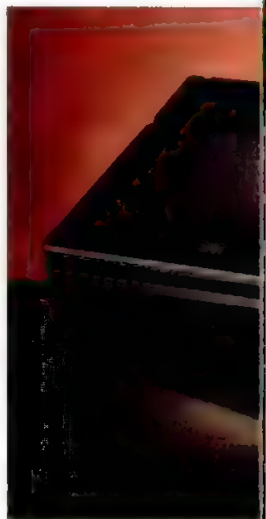
For instance, the battery system of your new notebook is the most advanced on the market. You can quick charge, or trickle charge, any time your system is plugged in. You can also take the battery out and use the optional charging stand if you wish.

Either way, you're sure to appreciate

Light Load

From

**Now, you can
computing po
The incredible**



10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but four times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent."

Value: Excellent." *Personal Computing* said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, *we Guarantee it!*

FAX Orders Dial: 612-633-1325
In Minnesota Call: 612-633-4591
MasterCard, VISA,
AmEx, Z-Card
and COD
Open 24 Hours a
day, 365 Days
a year.

Order Now
Toll Free

800-423-5891



SOFTWARE FINANCIAL MODELING

produces .WK1 or .WKS files, it also formats your spreadsheet's titles and cells and produces many predefined range names to assist in building formulas. Unfortunately, you can't import data—a serious limitation that forces you to rekey any existing financial data.

Allowing the consolidation of multiple companies would also greatly improve the package, which currently has a limit of one company. BrainChild Software acknowledges that this is a necessary enhancement and promises that a consolidation feature is in the works. The *Financial Wonder*'s lack of graphic capabilities should also be addressed.

Financial Wonder comes with a 30-day money-back guarantee, and it may take at least 30 days to properly understand and fully utilize the software. The reference manual is not well organized and needs to be more thorough when explaining application implementation, identification of formula numbers, and the appropriate account numbers for link-age purposes.

Financial Wonder provides an effective method for determining sophisticated financial projections. Given the appropriate application, it is useful for evaluating and planning an organization's fiscal performance.

The Mobley Matrix

by Jay P. Hartig

The *Mobley Matrix* is a philosophy of planning as much as it is a planning tool. Created by its namesake Lloyd Mobley, an IBM alumnus and founder of curriculum development for the Sands Point Executive School, the theory behind the program is that many entrepreneurs and corporate leaders often spread their focus too thinly over broad arrays of financial facts, and thereby overlook important emerging trends. The purpose of *The Mobley Matrix* is to create uncomplicated matrixes of results and planning strategies to be used as focal points for the planner's interests.

The \$1,195 program is supplemented by an operations manual and the book *A Guide to Finance*. This guide explains Mobley's philosophy of viewing a business at a high level and considering key financial data: the projection results and key ratios that demand the majority of an executive's attention to run a business effectively.

PLEDGING ALLEGIANCE

To utilize *The Mobley Matrix*'s best features—experimenting with strategies through the planning screen and using all the planning options available—you have to pledge allegiance to the Mobley method

PC FACT FILE

The Mobley Matrix, Version 2.1
Mobley Matrix International Inc., 12555 West Jefferson Blvd. #204, Los Angeles, CA 90066; 800-777-8181, 213-207-5310.
List Price: \$1,195, including Great Plains Hot-Link.
Requires: 640K RAM, DOS 2.0 or later.
In Short: A high-level planning tool well-suited to real-time experimentation with the effects of proposed strategies. The program comes with a respectable complement of built-in graphs that are easy to invoke. Copy Protected.

CIRCLE 410 ON READER SERVICE CARD

of building the model. Mobley describes the process as building horizontal, flow-in-time meaning into financial modeling. It's also a way to see why balance sheets change from period to period.

The Mobley Matrix's categories are intentionally designed to be compact and fixed, so that you need to regroup and summarize the balance sheet and income statement data from the historical accounting system. Import capabilities include columnar spreadsheet and ASCII, as well as *The Mobley Matrix*'s new *Great Plains Hot-Link*, which is its link to the *Great*

Plains Accounting Series program.

Even manual data input is manageable, since there are relatively few input fields, each with a pop-up 20-line detail window. The real effort is in the first attempt to regroup previous results into *Mobley* format and to generate the sometimes baffling "Adjustment Statement" column of the matrix. The adjustments aspect of the system is essential to the calculation of valid cash flow information, but creating it may confuse accountants and nonaccountants alike. The accompanying *Guide to Finance* explains how to generate the regrouping and adjustments to avoid error messages.

Certain fields require you to supply underlying details in order to get accurate analysis and ratios later in the process. You should not underestimate the necessity or the complexity of determining what should go into the detailed accounts you're asked to supply (for example, which costs are really fixed and which are variable?). The system provides defaults, but they're not recommended. Even if you find the regrouping process inconvenient, it does force you to adopt a high-level managerial view, rather than a shirtsleeve view of your business.

THE MATRIX METHODOLOGY

The interface of *The Mobley Matrix* is good, and there is a certain fluidity to its menu operations. The matrix itself consists of a five-column statement that flows the opening balance sheet to the closing balance sheet using the income statement, the cash flow statement, and the adjustment column to get there. You can create up to 100 periods of any length, but view only two comparative, sequential periods

Nore Corporation		Units: Thousands		Period: Year	
12/31/89		12/31/90		12/31/90	
BEGINNING BALANCE	ADJUSTMENTS	INCOME STATEMENT	CASH STATEMENT	ENDING BALANCE	
Cash	1500	0	Cash	2002	Cash
Accounts Receivable	1200	0	Collect	9500	Accounts Receivable
Inventory	1000	0	Cost of Sales	2500	Inventory
Other Current Assets	300	0	Other Assets	500	Other Current Assets
Goodwill	1000	0	Investment	400	Goodwill
Accounts Payable	1300	0	Depreciation	400	Accounts Payable
Notes Payable	3000	0	Interest	100	Notes Payable
Other Liabilities	500	0	Other Liabilities	0	Other Liabilities
Total Assets	7700	Total	1901	Total Liabilities	1801
-1000 & 000				-1000 & 000	
Taxes	600	0	Interest	702	Taxes
Accounts Payable	600	0	Trade Payables	2450	Accounts Payable
Current Liabilities	100	0	Wages	2350	Current Liabilities
Debt	2100	0	Loans	0	Debt
Other Liabilities	700	0	Other Liabilities	0	Other Liabilities
Capital	1000	0	Additions	4623	Capital
Retained Earnings	2630	0	Dividends	0	Retained Earnings
Total Liabilities	7700	Total	1901	Total Liabilities	1801

The Mobley Matrix Results screen shows all the business's key indicators on one screen by flowing the balance sheet from the beginning to the end of a period.

SOFTWARE
FINANCIAL MODELING

in detail simultaneously. When *The Mobley Matrix* planning cycle begins, you can uniquely name future plan scenarios as you create them.

A pull-down menu item lets you view a tree-like map of the periods in the system, as well as make additions and deletions. If you elect periods of less than a year, there is no current ability to generate year-to-date accumulations.

You can open and name new planned periods while working in the planning strategies screen. This is where the key *Mobley* ratios are displayed. As you edit, the system instantly recalculates the underlying "results matrix." Without exiting the screen, you can conveniently pop up one window to view an item's history and another window to view the impact on the financial statement of an assumption change.

The system tags the key ratios on display to indicate in which direction they will move if a change is applied to the data under the cursor. The history window also offers a projected value. The history is helpful, but you should use the projected values with caution since the formulas are not explained in detail. Planning is best accomplished via the strategies screen, where the software automatically recal-

culates costs and taxes, rather than through the Results screen. While projections are fast, you should take a hard look to revalidate fixed cost relationships and debt levels before taking action.

GRAPHING CAPABILITIES

The Mobley Matrix comes with a built-in set of easily accessed graphs based of course on Lloyd Mobley's ideas of what data drives most businesses. You can use the graphing capabilities for analyzing items of your own selection and expect the user-friendliness of a spreadsheet

package. Here again, the *Mobley* approach sharpens your focus on a manageable amount of important data so that you won't spend time inventing graphs not linked to *Mobley* strategies.

Despite the inherent smoothness and flexibility of the package, *The Mobley Matrix* would be even more appealing as a planning tool if it could handle automated linking and consolidation of related matrices, such as the divisions of a company. Such capability, currently a development priority at Mobley Matrix International, would also facilitate prospective acquisition analysis.

The Mobley Matrix is a useful tool for analyzing future strategies after the data is mechanically combined elsewhere. Business education is an almost ideal forum for *The Mobley Matrix*, provided all that is learned about the adjustments statement is forgotten prior to the accounting final.

The only real financial skills needed to use *The Mobley Matrix* effectively are the ability to regroup the accounts, make the mandatory detailed account splits, and figure out the adjustments to make, and how to do it. Its high-level, nonaccountant orientation can make using the package addictive. ■

Give Us Your Toughest Peripheral Sharing Problem

...or your simplest! Master Switch, the intelligent data switch from Rose Electronics, can handle it. The Master Switch series is so versatile and sophisticated, peripheral sharing becomes easy.

Anyone who appreciates ease-of-operation and technologically-advanced capabilities knows the Master Switch is the right choice...for sharing printers, plotters, modems, and any device with a serial or parallel port. Here's why:

- Any combination of serial or parallel ports
- Easy selection of peripherals
- User-expandable memory up to 4 megabytes
- Simultaneous access to all devices
- Rated 'fastest switch' by PC Magazine
- Advanced features include job queue, port contention, data collection, job control menu, initialization strings, pop-up menus, and many more
- Complete technical support; one-year warranty

The Low-Cost LAN Alternative
With our MasterNet software, the Master Switch provides many convenient LAN functions, such as E-mail, file transfer, and directory access.

Designed and manufactured in the USA. Field-proven in thousands of applications. The Master Switch answers any peripheral sharing challenge. Choose the intelligent data switch that handles your most complex needs, yet is easy to set up and operate... choose Master Switch.



(800) 333-9343

FAX (713) 933-0044 • (713) 933-7673
P.O. Box 742571 • Houston, Texas 77274
Call for complete information and our catalog of Switching and Sharing Solutions.
Dealer inquiries welcome.

For the cleanest, brightest windows.

Congratulations. You've not only also get 80286 processing power, found someone who does windows, you've found someone who up to 5MBs of memory. A 20MB hard disk drive. A battery that does them well.

NEC's new
UltraLite™ 286V.

A six-and-a-half-pound notebook that actually has a large, bright VGA screen. So



The new UltraLite 286V

gives you up to two and a half hours of power.

It comes in a package small enough to fit in a briefcase, too.

And there's

whether you're using Windows™ 3.0 or any other software, you'll get the kind of crystal clear image you only expect to find with larger computers. That's not all. You can

never an embarrassing spot or streak. For more information call NEC Technologies at 1-800-826-2255. The sparkling new UltraLite 286V. It'll make you shine.



Computers and Communications

Windows is a trademark of Microsoft, Inc. UltraLite is a trademark of NEC Home Electronics, Ltd. ©1988 NEC Technologies, Inc.

NEC

CIRCLE 395 ON READER SERVICE CARD

THE LAP MASS

PC WEEK POLL: 386SX-BASED LAPTOP/PORTABLE COMPUTERS

	Overall Weighted Score	Standard Software Compat	Display Quality	Overall Reliability	Overall Performance	Keyboard Quality	Product Support Quality	Paper Service Availability	Value Relative To Cost	Overall Functionality As Compared To Desktop PCs	Boards- Level Hardware Connect	Product Support Access	Quality of Document
Dell System [®] 316LT	1st	1st	2nd	1st	1st	1st	1st	1st	1st	1st	1st	1st	1st
Toshiba T3100SX	2nd	2nd	1st	2nd	2nd	2nd	3rd	2nd	2nd	2nd	2nd	2nd	2nd
Zenith SuperPort SX Model 40	3rd	3rd	3rd	3rd	3rd	3rd	2nd	3rd	3rd	3rd	3rd	3rd	3rd



It wasn't very pretty.

Last July, a computer company from Austin, Texas annihilated the competition in the PC Week Corporate Satisfaction Poll for 386™ SX based laptops.

In fact, the Dell laptop handily beat the Toshiba laptop in 11 out of 12 categories. And Zenith in all 12.

And that was before we introduced the brand new Dell® 320LT 20 MHz

386SX for only \$3,599. A sleek, sexy laptop that offers a Continuous Power Battery system. Up to 8 MB of RAM. A 3.5" 1.44 MB diskette drive. And a 20, 40, or 120 MB hard drive.

*Performance Enhancements: Within the first megabyte of memory 128 KB is reserved for use by the system to enhance performance. Dell cannot be responsible for errors in typography or photography. Dell and DELL SYSTEM are registered trademarks of Dell Computer Corporation. Intel is a registered trademark and 386 is a trademark of Intel Corporation. In Canada, configurations and prices may vary. Other trademarks and trade names are used to identify the entities claiming the marks and names of their products. Dell Computer Corporation disclaims.

EXXAS TOP ACRE.

THE NEW DELL SYSTEM 320LT 20 MHz 386SX AND THE DELL SYSTEM 316LT 16 MHz 386SX

STANDARD FEATURES:

- Intel® 80386SX microprocessor running at 20 MHz (320LT) or 16 MHz (316LT).
 - Standard 1 MB of RAM,* optional 2 MB of RAM expandable to 8 MB (on the system board using 1 MB SIMMS)
 - LIM 4.0 support for memory over 1 MB.
 - Adjustable and detachable 640 x 480 VGA Liquid Crystal Display.
 - One industry standard half-size 8-bit expansion slot.
 - Dedicated Data/Fax modem slot.
 - Socket for Intel 80387SX math coprocessor.
 - 3 5" 1.44 MB diskette drive.
 - 83-key keyboard with embedded numeric keypad and separate cursor control keys.
 - 1 parallel, 1 serial, and external VGA monitor port.
 - Connector for 101-key keyboard or numeric keypad.
 - Connector for external 5.25" 1.2 MB diskette drive.
 - Two removable and rechargeable NiCad battery packs utilizing Dell's "Continuous Power Battery System" (patent pending).
 - AC Adapter.
 - 12-month On-site Service Contract provided by Xerox.†
- 316LT, 20 MB, 1 MB RAM \$2,999
320LT, 20 MB, 1 MB RAM \$3,599

ADCODE119M

As with all our other award winners
you'll also receive Dell's unprecedented
service and support
with some incredible
features.

Like next business
day deskside service
from the Xerox Corporation[†] anywhere
in the contiguous United States, even
if you happen to be traveling. Superior
documentation. A one-year limited
warranty.

A toll-free technical support hotline

and a 30-day money-back guarantee.

No questions asked.

To order, call
800-284-7766

HOURS: 7 AM-9 PM CT M-F 8 AM-4 PM CT SAT.

IN CANADA, CALL 800-387-5752

So, if you're tired
of dealing with inept
salesmen, unreliable
products and computer
companies that won't

return phone calls, violence isn't the
answer.

Dell is. Call us today.



The World's Fastest Typists Will Be Performing On Our Keyboard At Fall COMDEX, 1991.



The search is on to find the fastest typist in the world.

The Key Tronic first annual World Invitational Type-Off finals will be held in Las Vegas in October. You could be the winner and drive away in a brand new '92 Buick Park Avenue — Plus take home \$10,000 cash, a new computer and some great memories of Las Vegas. You could even end up in the Guinness Book of World Records or on national television!

The Key Tronic® KB 101 Plus™, approved by Professional Secretaries International, has been selected as the "official" keyboard for the Type-Off.

The KB 101 Plus uses the industry-standard 101-key layout with enhanced

productivity features to help promote high-speed data entry. The KB 101 Plus is designed for optimum operator comfort — with a low-profile design, adjustable key feel, adjustable legs and a positive tactile feedback. This means consistent touch and low fatigue.

If you or someone you know can make a keyboard smoke, call Key Tronic today and ask for the official entry information packet. This is the computer event of the year, and you can be part of it.

Call 1-800-262-6006

* For Your Official Entry Form.

Washington State call 1-509-927-5515.

*Rules of participation included with entry form. Void where prohibited by law.
CIRCLE 190 ON READER SERVICE CARD



 **Key Tronic®**

by
Winn L. Rosch

Lab Notes

Even though your PC doesn't transmit 2 Live Crew or George Carlin reciting the seven words you can't say on the radio, the Federal Communications Commission is interested in what your personal computer is broadcasting. FCC standards limiting the radio waves that your PC is allowed to emit are sufficiently demanding that many computer manufacturers fail to comply with them. The result is that thousands of personal computers—possibly your next "bargain" PC purchase—are sold illegally each year. And as you might have guessed, *you* are responsible if your PC exceeds permissible radio frequency interference standards.

You may not have thought of your PC as a radio transmitter, but it is. A computer—indeed, any electronic device that uses high internal operating frequencies—can flood the ether with emanations that almost any radio or television set can pick up. These unwanted radio emissions are an unintended by-product of a simple physical principle: Any varying electrical current, including the minuscule logic signals inside your PC, creates an electromagnetic field. Every time the current flow starts, stops, or changes direction, an electromagnetic field is radiated into space. At high frequencies these radiations take the form of radio waves.

Almost anything that goes into the airwaves falls under FCC jurisdiction. The Commission has Congressional authority to enforce its rules over the signals emitted—however unintentionally—by your computer. Every personal computer (and most computer peripherals) legally offered for sale in the United States must comply with the rules and regulations of the FCC. Specifically, that means that every personal computer should wear an FCC Class B certification sticker unless the computer maker has obtained an explicit waiver from the FCC.

REGULATION PROS AND CONS

Few people know what the FCC rules govern, what they are meant to achieve, and

What You Should Know About the FCC Emission Standards

■ While Big Brother isn't patrolling the streets with directional antennas to find out whether your PC meets radiation standards, you're responsible for living within them.

why anyone should care. In ignorance or in defiance of the FCC's authority, many computer manufacturers illegally offer PCs for sale in the U.S. For the conscientious computer designer, complying with the FCC certification procedure is the last hoop to be leapt through before the product can appear on your dealer's shelf. FCC certification can take six to eight weeks. This slows your access to new technology and may give an illegal seller a competitive head start.

To many users, the benefits of certification may seem slight. FCC certification does not guarantee that a computer product is safe, for example; health and safety are not the concern of the FCC. Nor does it absolutely guarantee that a given computer product won't interfere with your radio or television reception. (That's why the FCC requires that instructions for eliminating the interference caused by a computer be included in the manual, even for equipment that *is* properly certified.)

All that FCC certification shows is that a particular product won't exceed a given *level* of interference with broadcast ser-

vices such as television and radio transmissions (including cellular phones, emergency radio services, and the radio-navigation equipment used by airplanes). Achieving that level of protection *is* something for which you and your neighbors should be thankful, however, even if it often creates a headache for computer manufacturers.

Preventing interference is one of the most important reasons for the FCC's very existence. The Commission was created in 1934 primarily to clean up the mess made by early broadcasters who, in the 1920s, transmitted signals whenever, wherever, and however they wanted to. The result was that in some places the airwaves became such a thick electromagnetic goulash that *no* radio could successfully receive a single program. The FCC was given the job of imposing order on all of this chaos, and to do this, it created strict rules to prevent interference between radio stations. As other services began to use the airwaves, the FCC set rules for them, too, always with the same purpose: to prevent signals from interfering with one another. The FCC was not created to limit what you could hear. Rather, it was created so that it would be possible to hear clearly the signals that were there.

The Commission's authority over radiated electromagnetic waves extends from frequencies so low—9,000 Hz—that you could hear them if they were sound waves to frequencies you could almost see as light waves—300,000,000,000 Hz. While at first the FCC was interested only in signals that were meant to be broadcast, the advent of modern computers created a new

Lab Notes

source of radio interference. As shown in Figure 1, the clock frequencies of today's computers sit in the middle of communications frequencies and are edging up toward the television and FM broadcast bands. (A few older computers operate at frequencies within the AM broadcast band, but IBM-standard PCs have never stooped so low.)

Is the potential for radio and television interference really a cause for concern? It's hard to summon up much sympathy for someone who complains about a few undulations added to the televised image of Roseanne Barr by a nearby computer. But when the FCC took control and created the computer emission standards that resulted in the Class B certification process, the situation really was more serious than this. At the time—the late 1970s—emissions from computerlike equipment were already proving a dangerous, possibly life-

threatening problem. For example, according to the FCC, the police departments of several Western states reported their radios were receiving interference from coin-operated video games that were based on computer-style circuitry. And in another case at an East Coast airport, interference in aeronautical communications was traced to the computerlike electronic cash register at a drug store a mile away.

Moreover, hobbyist-style computers and hand-held calculators were already on the market, and these were known to generate spurious radio signals. The Radio Shack TRS-80 was notorious for the television interference it generated. And although the extent of the phenomenal personal computer boom of the 1980s was hardly foreseen, the increased use of high-frequency digital logic circuitry promised that the situation could only become worse.

In a first attempt to regulate the emissions of personal computers, the FCC developed a special set of rules for them, en-

acted in October 1979 as Subpart J of Part 15. Compliance with these rules has been blazoned forth on the certification stickers of millions of PCs.

In March of last year the rules were rewritten to bring together computers and other equipment that generated similar interference, under a new Subpart B, Part 15, of the FCC rules. The new rules apply to all electronic equipment that inadvertently creates radio signals—equipment the FCC calls *unintentional radiators*—as well, of course, as devices that intentionally create radio signals for communications or related purposes.

WHAT IS COVERED

The new FCC rules cover computer systems, from mainframes to pocket calculators, with personal computers in between. Moreover, many PC peripherals must undergo the same certification process as do full computer systems. The rules explicitly define which peripherals require certification and which do not. Some examples of these are given below and are illustrated diagrammatically in Figure 2.

Peripherals, according to the FCC, include both internal and external devices used to enhance the operation of a personal computer. External devices connected to a PC require their own certification unless they are sold together with the computer, in which case the PC and peripheral must be certified together. An example of the latter is the PS/1, which is sold as a computer and monitor combination. Because the two pieces must be connected together to operate, they must be FCC certified when connected together and working.

Mice and joysticks are explicitly excluded from the need for certification because they contain no high-frequency circuits and use no high-frequency signals. However, a smart mouse with its own internal microprocessor would require certification.

Internal peripherals need to be certified only if they affect the speed or performance of the computer or if they can be connected to external devices. A serial communications board or a graphics board needs FCC certification because of its external connector. A turbo board or microprocessor upgrade board like the IBM Model 70 PowerPlatform requires certification because it increases the speed (and thus the radiation potential) of the computer. On the other hand, a memory-only expansion board or a hard disk controller does not require certification.

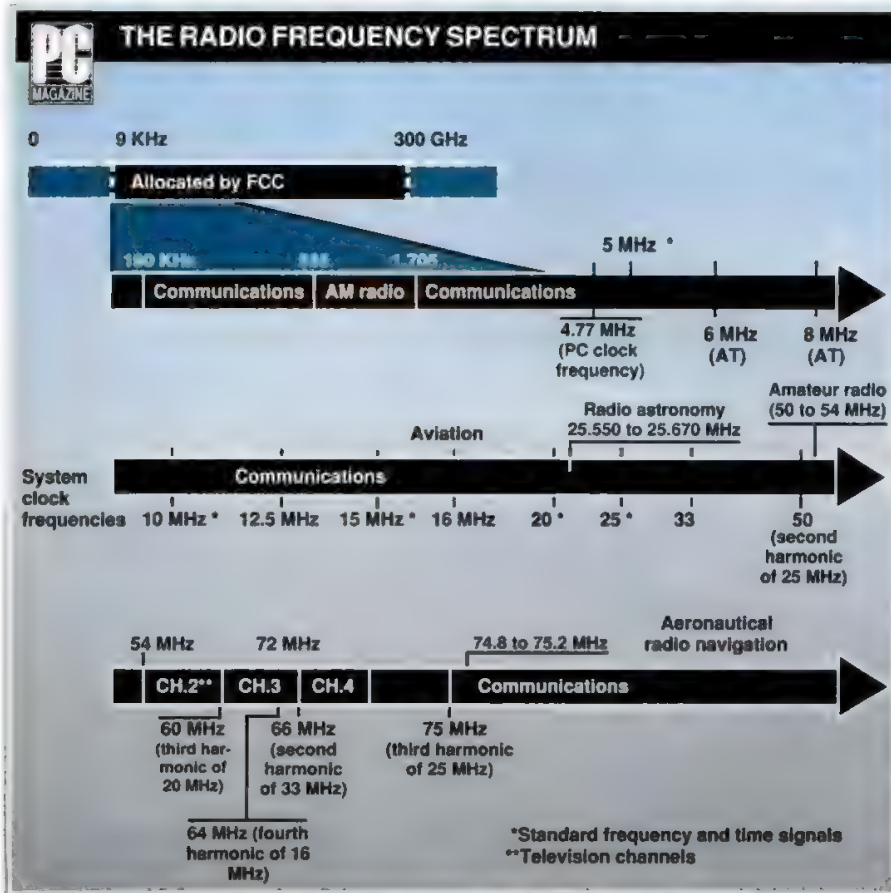


Figure 1: The FCC allocates the permissible usage of the RF (radio frequency) spectrum and sets limits on emissions that may interfere with that usage. Note that the clock frequencies of PCs fall within frequency ranges nominally allocated to various communications services and that clock frequency harmonics of some PCs may interfere with broadcast television signals.

Lab Notes

Computer components ordinarily used only in making a computer at the factory are considered to be subassemblies, and as such do not require item-by-item certification. When such subassemblies are united to make a personal computer that will be sold to end users, it is the entire computer that must be certified. Cases, motherboards, and power supplies are specifically designated as subassemblies and need not—indeed cannot—be FCC certified. Thus a computer motherboard does not require separate certification, but once it is installed in a case with a power supply to be sold as a personal computer, the entire assembly must be certified.

The claim sometimes made by small computer makers that their product is made only from FCC-certified subassemblies and so does not require FCC certification is simply false. A personal computer cannot be built without a power supply, case, or motherboard, and these three subassemblies cannot be FCC certified as individual units. Any computer manufactured from subassemblies must be FCC certified as a completed unit.

The rules recognize that the test equipment a hobbyist would need to check the amount of interference generated by home-brew computers is more expensive than most individuals can afford. Consequently, the FCC rules allow a specific exemption from the certification requirement for homemade personal computers. Implicit in this exemption is the assumption that a single homemade computer won't generate enough interference to worry about—at least on a widespread basis. For this exception to apply, however, the home-built PC must meet all three of the following criteria: (1) It must not be marketed or offered for sale; (2) it must not be made from a kit; and (3) it must be made in quantities of five or fewer, solely for personal use. Most commercial computer kits, on the other hand, must be certified by the FCC.

Some other types of commercial personal computer equipment are specifically excluded from the need for certification under FCC rules. Very-low-power devices—anything that uses less than six nanowatts (six billionths of a watt) in its high-frequency circuits—are unlikely to radiate substantial interference, so such equipment is excluded from certification

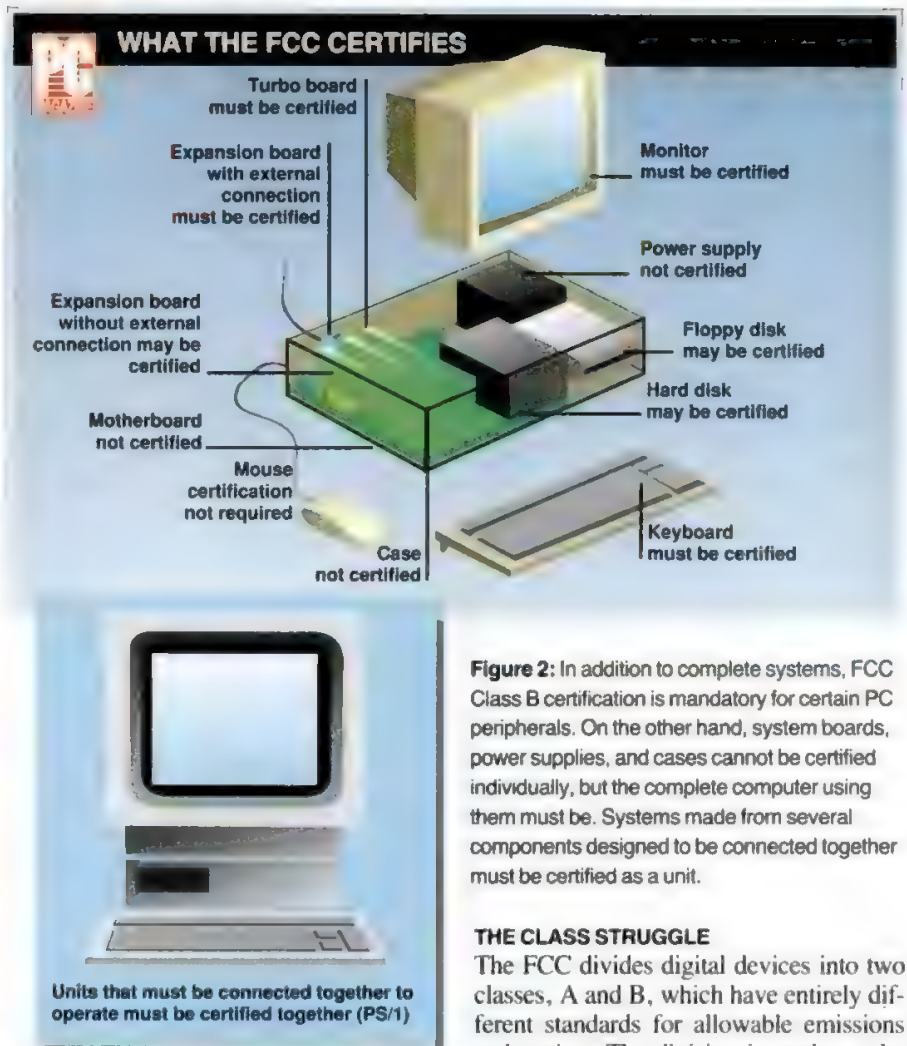


Figure 2: In addition to complete systems, FCC Class B certification is mandatory for certain PC peripherals. On the other hand, system boards, power supplies, and cases cannot be certified individually, but the complete computer using them must be. Systems made from several components designed to be connected together must be certified as a unit.

THE CLASS STRUGGLE

The FCC divides digital devices into two classes, A and B, which have entirely different standards for allowable emissions and testing. The division is made on the basis of where the equipment is likely to be used. Class A digital devices are those that are suited only to business, commercial, and industrial applications. Class B applies to digital devices that are likely to be used in the home. As we shall see, the emission standards for Class B are much more difficult to meet.

Despite their *presence* in business, commercial, and industrial settings, the FCC rules explicitly define personal computers—all personal computers—as Class B equipment. The rules define the term *personal computer* so that just about anything that you might think of operating qualifies. What was classed as a “home” computer years ago—for example, the Commodore 64—is covered because the FCC’s Class B definition includes any computer that uses a television set as its display device. And a computer with a dedicated display system, such as the PC that’s probably sitting on your desk, also meets the FCC definition of a personal computer if it has all three of the following

Lab Notes

characteristics: (1) It is marketed through a retail dealer or direct-mail outlet; (2) advertisements of the equipment are directed toward the general public rather than restricted to commercial users; and (3) the computer operates on battery or 120-volt AC electrical power.

Note that how a particular computer was actually sold does not matter. As long as a particular model has been offered for sale through a dealer or direct-mail outlet, it meets the first requirement.

All portable personal computers are considered Class B devices because their very portability makes them likely to be used in a residential setting. Although Class A portable computers are theoretically conceivable—for example, a ma-

chine dedicated to taking seismological measurements in oil prospecting—general-purpose portable PCs cannot qualify as Class A devices. Thus, any portable computer offered to you for sale as a Class A device violates the FCC rules. Legally, such a computer cannot be sold.

The definition of Class A equipment implicitly covers mainframes and minicomputers, most of which use industrial-standard 230-volt power. According to the rules, however, the most important distinguishing characteristic is that Class A devices are of such nature or cost that they would or could not be used at home by individuals.

Here, the FCC gives PC manufacturers a potential out. Manufacturers or importers can apply to the FCC to have specific

MEMORY UPGRADES

From The Memory Specialists

Sigma Data Delivers. . .

- ☒ Knowledgeable Sales & Service
- ☒ Immediate Shipping
- ☒ Superior Value
- ☒ 5-Year Warranty
- ☒ 24-Hour Replacement Service
- ☒ A Supplier of **Kingston** Memory
TECHNOLOGY CORPORATION
for IBM, Compaq, Toshiba, Apple, HP, AST,
Dell, DEC, Epson, NEC, Zenith, SUN,
AT&T and other CPU's.

 **Sigma Data**
P.O. Box 1790, New London, NH 03257
NH (603)526-6909 Fax: (603)526-6915

VISA, MC, AMEX, COD and Qualified PO's accepted.

UPGRADE TODAY!!! CALL...

1-800-446-4525

PROFIT FROM 10 YEARS OF EXPERIENCE

No hard-and-fast rule
defines what is too
powerful or too
expensive to be a
computer suitable for
home use.

personal computers treated as Class A devices *providing* the computer is of such a nature—priced too high or delivering performance too high—that it is not suitable for residential or hobbyist use.

No hard-and-fast rule defines what is too powerful or too expensive to be a computer suitable for use in the home. One general (but not absolute) guideline used by the FCC, however, is that a base retail price higher than \$5,000 makes a computer more likely to be used in a business-only setting. Further, computers based on 80486 (and some 80386) microprocessors are currently powerful enough to be *likely* to earn the FCC approval for rating as Class A devices. As the power of PCs increases and the expectations of home users rise, however, this guideline will probably shift.

A manufacturer cannot simply *declare* that his computer is a Class A device. He must ensure that it is not knowingly sold to someone intending to use it in a residential area. If the manufacturer wants to be abso-

Lab Notes

lutely sure that his device qualifies for Class A treatment, he can write to the FCC for *letter notification*, which confirms that his computer meets the requirements of Class A equipment.

There's quite a substantial incentive for a manufacturer to want his products treated as Class A devices. Not only are the emission requirements more lenient, but a PC rated as Class A does not require undergoing the lengthy FCC testing and certification process. A Class A device can be tested and verified by its maker as being in compliance with FCC rules.

The latter process is admittedly quicker. It also offers the potential for creative interpretation of the rules. For example, a manufacturer might succumb to marketing pressure and say his equipment has been verified for compliance before it actually is. However, the FCC can double-check Class A verified equipment and prohibit its sale if it doesn't in fact meet the standard and punish those who fraudulently claim to have verified equipment.

THE LIMITS

The FCC rules set limits on two kinds of emissions: *conductive* emissions, which travel through the wires in the power cord; and *radio frequency* (r.f.) emissions, which are radiated from the computer into space. The Commission is concerned with conductive as well as with broadcast emissions, because PC signals that escape through the power cord can be carried into other equipment connected to the same electrical circuit. Figure 3 shows the limits for the two kinds of emissions both for Class A and Class B equipment. As you will note, the maximum permissible levels vary with frequency.

The justification for the distinction between Class A and B devices may seem vague, and the different forms of verification procedure may seem unjustifiable. In fact, however, there are good reasons for both.

The emission limits for a Class B device are not arbitrary or capricious. They represent a level believed by the FCC to be low enough to avoid interference to radio or television reception when there is more than one wall and 30 feet separating the computer and the receiver. That 30 feet and one wall is a reasonable description of the separation between one household and

CLASS A AND B EMISSION LIMITS		
CONDUCTIVE LIMITS:		
	Signal level (millivolts)	
Frequency (MHz)	Class A	Class B
0.45 to 1.705	1000	250
1.705 to 30.0	3000	250
RADIATED LIMITS:		
	Maximum field strength (microvolts per meter)	
Frequency (MHz)	Class A (measured at 10 meters)	Class B (measured at 3 meters)
30 to 88	90	100
88 to 216	150	150
216 to 960	210	200
960 and above	300	500

Figure 3: The FCC classifies personal computers as Class B digital devices, which must meet stricter standards for both conductive and airborne emissions than the industrial equipment designated as Class A.

another. The standard is thus designed so that if Class B equipment causes interference at all, it will bother only the home of the person owning the computer. The neighbors shouldn't have anything to worry about.

Class A equipment, on the other hand, is allowed to produce interference in equipment nearly ten times farther away than Class B equipment. The higher allowable limit for possible interference is

Class A equipment, on the other hand, is likely to be unique—as, for example, a custom-installed mainframe in an environmentally controlled computer room. Sending a one-of-a-kind mainframe computer to the FCC testing lab would be impractical at best. Moreover, because more Class B than Class A devices are likely to be produced, a higher degree of assurance against interference from the more popular equipment would seem warranted.

Of course, most manufacturers won't make millions of something until they are certain that the design will pass the certification tests. In most cases, manufacturers check the emissions of the equipment themselves (or have a private testing lab do it) before they submit it for certification. The FCC's assumption is that the computer maker will know what the requirements are and manufacture to meet them. If he blows it, it's his own fault.

Under the FCC rules, commercial or industrial equipment can be sent to the FCC to be certified as Class B equipment, and Class B equipment can be used in business locations. The opposite of this, however, is not true. Class A equipment should not be used in residential areas, because its higher permissible radiations may cause interference to neighbors' radio and television reception.

THE RADIO POLICE

The law doesn't say you can't use a Class A device in your home, however, nor will the Radio Police break down your door if you do. The FCC rules implicitly allow you to use a Class A device in your home—as long as no one is bothered. If

The FCC rules set
limits on two kinds of
emissions: *conductive*
and *radio frequency*.

based on the assumption that most residential areas are substantially more than 30 feet from industrial or commercial buildings. The greater separation means that even with greater radio-frequency emission levels, Class A devices still should not bother the neighbors.

The different testing arrangements—verification versus certification—for Class A and B equipment reflect hard realities as well. Class B products are those mass produced in the thousands or millions. Sending a sample Class B product to the FCC should cause no real hardship except for the delay imposed by the certification process.

Lab Notes

your computer causes interference to someone's radio or television reception, however—whether your PC is a Class A or Class B device—you are responsible for eliminating the interference. If you don't, the FCC can order you to stop using your computer until you fix the interference problem. And if you don't obey the order, you may be fined or imprisoned. That threat alone should be sufficient to make you think twice about using a Class A device at home.

If the Commission's rules seem to incorporate more than a bit of Big Brother, get ready for more. The FCC also has the authority to demand to see your personal computer at almost any time it wants. The FCC rules require that the owner of any Class A or B device (or any equipment subject to the FCC rules) make the equipment and any accompanying certification available for inspection upon request at any reasonable time (generally, that means 9 A.M. to 5 P.M. on workdays). You must also "promptly furnish" information

about the operation of your PC to any FCC representative who calls upon you.

Don't bother watching warily out your windows for big vans slowly driving down your street with dish antennas pointed in your direction, however. Those vans are things of cheap spy novels and even cheaper movies. In reality, the FCC uses ordinary-looking cars that may not even have visible antennas. Moreover, the FCC doesn't arbitrarily go out looking for people using Class A computers in their homes. The interference-locating equipment goes out in response to complaints, so the odds are you'll hear from your neighbors before the FCC knocks.

NO SALE

The FCC is more concerned about preventing the sale of interference-causing equipment in the first place so that you don't get a chance to put wavy lines through all your neighbor's favorite TV shows. To that end, the FCC rules prohibit equipment that meets the Class B definition from being sold or offered for sale without certification. Class B personal computers that are not FCC certified cannot legally be advertised for sale, although

ads announcing products with a disclaimer noting that the device is not yet certified (and thus, not available for sale) are permitted. If a company markets a computer that has neither been approved by the FCC as a Class A device nor certified as complying as a Class B device, that company can be fined and ordered to stop selling the equipment. If the company continues to flout the rules, company officials can be jailed. According to the FCC, most companies get into compliance right away.

Before a Class B device is certified, it can be displayed at shows and demonstrated with the appropriate disclaimer attached. The primary prohibition is against sales of noncertified equipment. Thus, for example, precertification demo units can be distributed but not sold to computer dealers for display.

The certification process requires that a representative sample of the personal computer or peripheral be sent to the FCC Laboratory in Columbia, Maryland. The FCC will then test the device to determine whether its emissions are within the limits specified for Class B devices. If the unit qualifies, the FCC certifies the unit and issues a certification number.

It's the fastest But it will never cat

You can go fast. You can go safe. Just not together. Until EtherLink® 16.

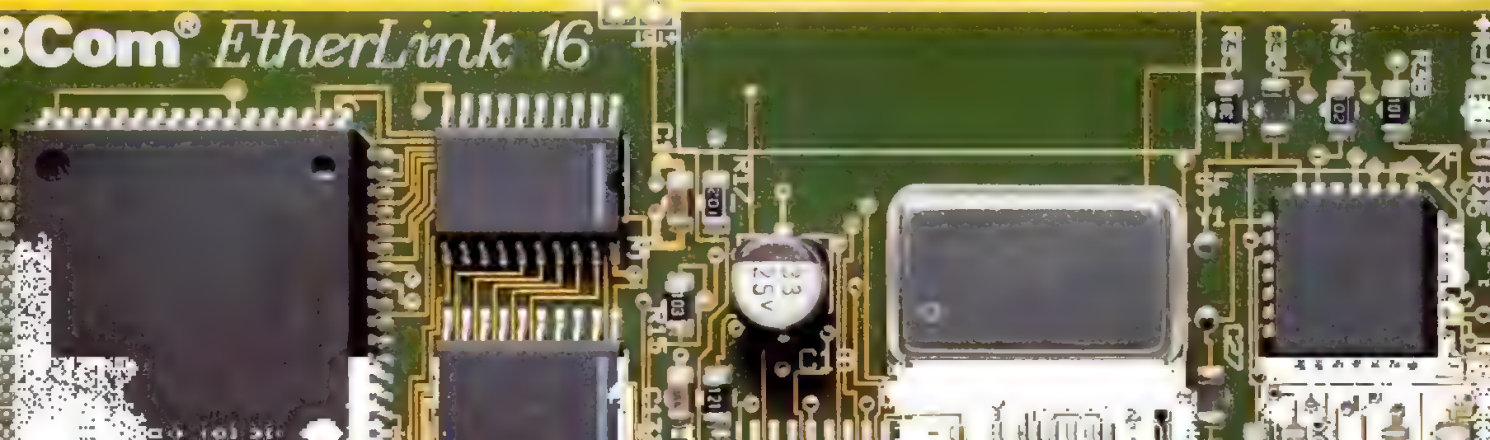
This 16-bit Ethernet network adapter is up to 90 percent faster than its major competitors.* Yet it runs with a lifetime warranty.

You can use it with your IBM PC, XT, AT, PS/2 Model 25 or 30 and compatibles, as well as EISA computers. And it's ready to run on NetWare, LAN Manager and 3Com® 3+Open™.

What's more, EtherLink 16 is speedy to install,

*An independent laboratory, LanQuest Group, did the testing, and you can get a copy of their glowing report on speed by calling us at 1-800-NET-3Com. You can also request the data on reliability, and learn why that of two million 3Com adapters in use, 99.5 percent have never needed repair.

3Com® EtherLink 16



Lab Notes

Every model of a personal computer that differs as to case, power supply, or motherboard must be separately certified. Thus, if a manufacturer offers two case styles—desktop and floor-standing—and three system boards—286, 386SX, and 386DX—each of the six configurations must be individually certified.

A personal computer need not be recertified if it differs from a certified model only by the addition of a certified peripheral. For example, a manufacturer could create a separate model by installing an extra FCC-certified serial board. In this case the "new" model would be covered by the certification of the old one. As long as the model changes do not affect the speed or radiation potential of the equipment, recertification is not required.

IBM has proposed that the FCC begin certifying motherboards. This would allow manufacturers greater freedom in building a variety of computer models and would also let them install newer, more-powerful certified motherboards in al-

ready-certified systems, without recertification. Should the FCC accede to this proposal, new personal computers could be introduced without the enforced hiatus of the certification period.

Computers from different vendors can share the same FCC number, providing they are identical units made by a single manufacturer and differ only cosmetically—for example, in label or color. In the past, the FCC required that it be notified about different trade names used on certified products. This requirement has been relaxed under the new (1989) rules. On the other hand, computers with different packaging, processors, or power supplies cannot share an FCC certification number even if they are made by the same manufacturer.

All of these rules may seem to make FCC certification important only to computer manufacturers. And it remains true that in the end, whatever its certification class, you are still liable for clearing up any interference problems your PC causes your neighbors. But FCC certification should be important to you. The obvious reason is that a Class B device is less likely to cause interference and thus makes it less likely

that you'll get involved in an imbroglio with your neighbors about their television reception.

Moreover, lower emissions at radio frequencies generally go hand-in-hand with lower emissions at lower frequencies, such as the 60-Hz fields that some scientists now believe may promote cancer and have other biological ill-effects. (This issue was discussed in Lab Notes in the December 12, 1989, issue of *PC Magazine*.) That can be disturbing if you worry about the health effects of low-frequency radiation.

Finally, all else being equal, achieving Class B certification takes a better design and better workmanship. Although a certification sticker is no guarantee that a particular product is well made, that sticker does show that the PC or peripheral to which it is attached has met an important technical standard that uncertified equipment has not. Although you should not rely entirely on FCC certification when buying a PC, it does give you one more piece of evidence about the quality of your prospective purchase. ■

Winn L. Rosch is a contributing editor of PC Magazine.

board available. ch up to its warranty.

because there are no jumpers to slow you down.

But why not see for yourself?

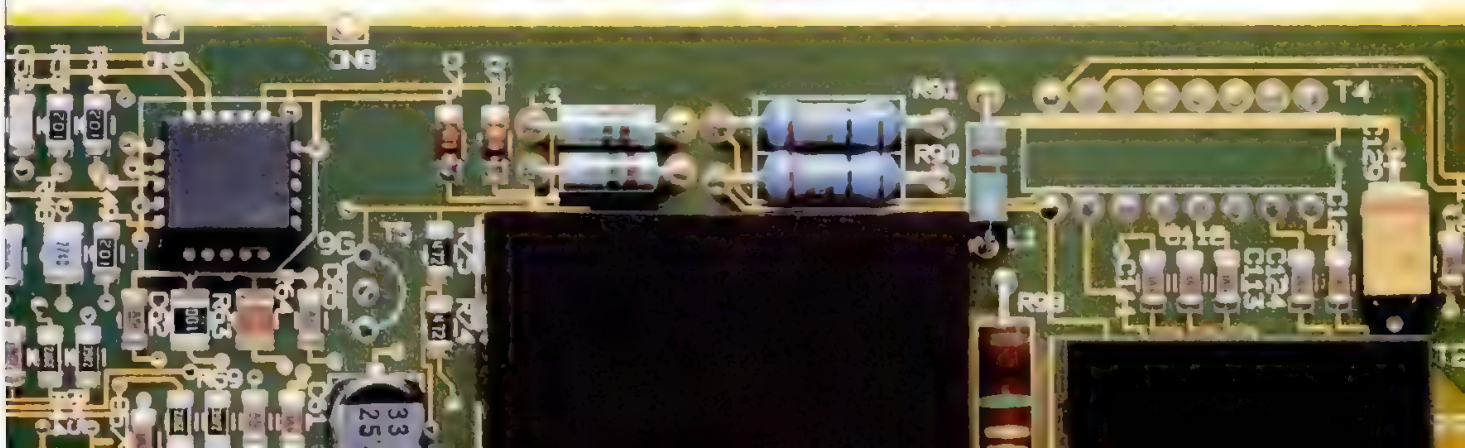
Just call 1-800-NET-3Com Dept. D3656 for the name of your nearest 3Com reseller.

CIRCLE 293 ON READER SERVICE CARD

3Com

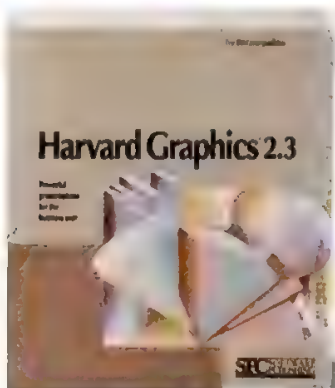
We network more types of systems
to more types of systems.™

©1990 3Com Corporation, 5400 Bayfront Plaza, Santa Clara, CA 95052. Telephone (408) 764-5000. 3Com, 3+ Open, EtherLink and the 3Com tagline are trademarks of 3Com Corporation. IBM, XT, AT and PS/2 are trademarks of International Business Machines Corporation. NetWare is a registered trademark of Novell, Inc. LanQuest is a trademark of LanQuest Group.





**MAKE YOUR NEXT
DOG AND PONY SHOW
EVEN BETTER.
EVEN FASTER.**



**INTRODUCING NEW
HARVARD
GRAPHICS® 2.3**

Harvard Graphics 2.3 from Software Publishing Corporation is packed with new features for even more effective presentations.

For starters, we've added a gallery of pre-designed charts. Pick one that looks good, enter your data, and there's your chart, with the colors and layout you'd expect from a graphics professional.

We've also fully integrated Draw Partner,™ our advanced drawing package, so you can modify your chart with tools like rotate, skew and zoom—without losing the tie to your charting

data. What's more, you can build a whole new type of ScreenShow®—HyperShow.™ Create hot buttons in any chart for instant access to backup information. And tailor the flow of your presentation as you give it.

Harvard Graphics has always been the quickest way to great-looking presentations. That's why it's the best-selling business graphics software. Now, you can do more than ever. Faster than ever.

**SPC SOFTWARE
PUBLISHING
CORPORATION**

FOR UPGRADE INFORMATION, CALL 1-303-799-4900. FOR A FREE DEMO DISK, CALL 1-800-345-2888, OPERATOR 304.

For upgrade information in Canada, call 1-416-566-0566. Harvard Graphics is a registered trademark of Software Publishing Corporation. Draw Partner, ScreenShow and HyperShow are trademarks of Software Publishing Corporation. ©1990 Software Publishing Corporation, 1901 Landings Dr., Mountain View, CA 94039-7210

by
Douglas Boling

Utilities

Did you have to discard your favorite memory management program when you installed *Microsoft Windows 3.0*? Does one of your applications need more memory than you have left if you use DOS 4.0? Do you wish you could boot up occasionally with a clean set of CONFIG.SYS and AUTOEXEC.BAT files to see whether a program works without your usual memory-resident utilities?

MBOOT, for *multiboot*, is designed to solve these and similar configuration problems. MBOOT lets you keep four completely different configurations on one machine. You can set up each session to use not only different CONFIG.SYS and AUTOEXEC.BAT files, but even different versions of DOS. Sessions can also be set to boot OS/2, if it is installed on your system. And to simplify everyday operation, you can set a time-out value to boot up a specific configuration automatically, if you make no initial selection.

You might think of MBOOT as a terminate-and-stay-resident (TSR) program for a disk drive. Instead of loading it into system RAM, you install MBOOT on a bootable disk drive. Normally, of course, this will be drive C:, but to test the program on your system, you can also install MBOOT on a diskette. (A diskette with MBOOT installed is also convenient for carrying around multiple versions of DOS on one diskette.) Installation uses a simple menu-driven procedure, after which MBOOT will run and bring up the menu shown in Figure 1 each time the system is rebooted.

You can download a working copy of MBOOT.COM from PC MagNet, as explained in the sidebar "MBOOT by Modem." If your communications setup cannot handle binary files, you can download the ASCII file MBOOT.BAS and run this once in BASIC to create MBOOT.COM. The program itself is written in assembly language, and MBOOT.ASM is also available for downloading from PC MagNet. Because of the complex nature of this utility and because it modifies the boot record of your hard disk, however, we sug-

MBOOT.COM: A Multiple Boot Program For Your PC

■ Now you can select from among several configurations and operating system versions each time you boot up.

gest that not even experienced assembly language programmers try to modify the source code.

If you do not have a modem, you can also get the source code by mail or fax by sending a *postcard* with your name, address, and fax number (if applicable) to Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; Attention: Katherine West. No phone call, please.

USING MBOOT

Back up your hard disk before you install MBOOT. We've successfully tested it on a variety of machines in PC Magazine Labs, but you should never install *any* program that writes to the boot sector of your disk without backing it up first. Moreover, while installation is a simple menu-driven process, *anyone* can make mistakes.

The syntax to start installing a copy of MBOOT is:

MBOOT d:

where *d*: is the drive on which you want to install MBOOT (which must be the drive from which the system boots). Usually this restricts installation to drive A: or C:. Before it installs itself, MBOOT will bring up

a menu to help you set up the program. These menu functions let you configure each of the four sessions, set the default session, and install or remove the program.

Items (and all other MBOOT menus) can be selected from the main menu by using the cursor or Tab keys to highlight them and then pressing Enter. Alternatively, an item can be directly highlighted by typing its menu number. The Esc key takes you back to the previous menu without changing anything; if you hit Esc from the main menu, the program will terminate without changing any previously installed options.

As shown in Figure 2, the main screen displays both the current session data and (below it) the main menu. When MBOOT is run for the first time, the first session will automatically display the data from your current AUTOEXEC.BAT and CONFIG.SYS files. After MBOOT has been installed, the session data will be read from the installed file MBOOT.SYS.

The first selection on the main menu, Add Session, lets you add or rename a session. File size constraints dictate that no more than four sessions can be accommodated; an error message will remind you to delete a session first if you try to exceed the limit.

The Add Session submenu offers four choices: Add Session, Rename Session, Update and Return, and Return Without Changing. If you choose Add Session at this point, you'll be prompted for the new name you want to give to this configuration and for the names of the files you want this session to use as its AUTOEXEC and

Utilities

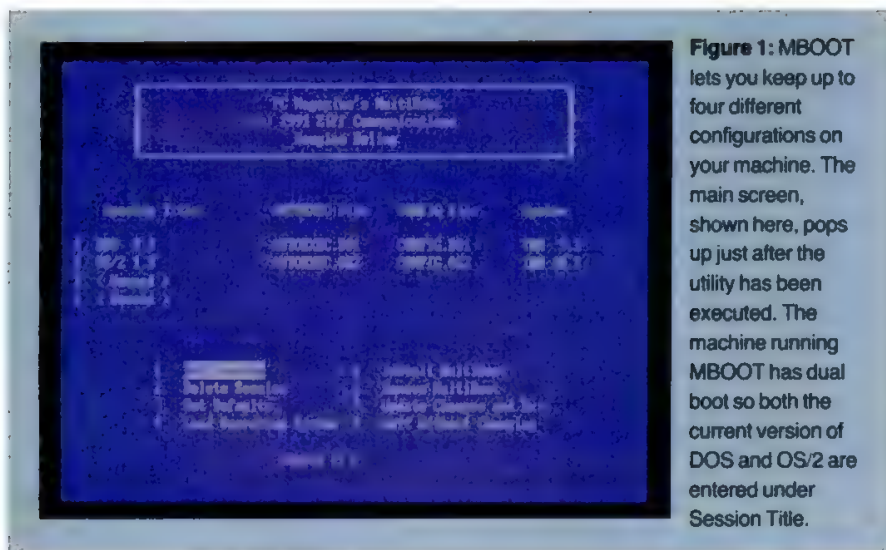


Figure 1: MBOOT lets you keep up to four different configurations on your machine. The main screen, shown here, pops up just after the utility has been executed. The machine running MBOOT has dual boot so both the current version of DOS and OS/2 are entered under Session Title.

CONFIG files. These files, which you create exactly as you would any AUTOEXEC.BAT and CONFIG.SYS files, must be located in the root directory of the boot disk. If the files do not exist, MBOOT will display an error message and ask for the filenames again.

If you have used MBOOT to install more than one operating system on your boot drive, you will also be presented with a menu of the available operating system choices for the session. You must be careful to match the proper CONFIG.SYS file with the operating system chosen. If an incorrect CONFIG.SYS file is used for an OS/2 session, for example, that session will probably lock up the system when it is booted. Note that for OS/2 sessions, MBOOT changes the AUTOEXEC file, not the STARTUP.COM file. Since most users will have only one OS/2 session, however, this should not be a problem.

Several additional constraints that apply to OS/2 should be noted. If you intend to use OS/2 for one of your four sessions, you must install it *with the dual boot option*, using its own installation procedure, *before* you install MBOOT. (If you later want to add OS/2, you'll have to uninstall and then reinstall MBOOT.) Note, too, that when you then install MBOOT, you must do so from native DOS (that is, using a DOS bootable floppy), *not* from the OS/2 DOS compatibility box. Finally, you should also note that OS/2, Versions 1.2 and later, permit selection of a new file system, known as the High Performance File System (HPFS). MBOOT is designed to operate with the conventional DOS file

structure, however, and will not install on an HPFS disk.

The Rename Session choice from the Add Session submenu simply prompts you to designate a new name for a session that has already been established. The operating system choice, the AUTOEXEC filename, and the CONFIG filename are not changed when you choose this option.

The remaining two choices on the Add Session submenu are Update and Return, and Return Without Changing. While both of these selections return you to the main menu, they perform the different functions their names imply on any changes you have entered. Since you might select the Return Without Changing option by mistake, MBOOT asks you to verify a quit selection if changes are to be discarded.

The Delete Session selection on the main menu lets you discard unwanted sessions, thus making space for new ones. The submenu has three choices: Select a Session to Delete, Update and Return, and Return Without Changing. When you select the first of these options, MBOOT lists the sessions available for deletion. (The session currently in use cannot be deleted.) When you pick one, you'll then be asked whether the corresponding AUTOEXEC and CONFIG files should also be deleted. The session data and files are not actually deleted until the Update and Return selection is chosen from the menu, again affording protection against accidents.

The Set Defaults selection on the main menu lets you designate a default session and time-out value. The Default screen lists the current defaults and provides a

menu for changing them. The Set Default Session option lists the available sessions; a selection made here will become the default session at the next boot. The Set Default Time-out selection prompts you for a time-out value in seconds. Entering a zero disables the time-out. If no time-out is specified, MBOOT waits at the boot menu until a session has been selected.

Selecting the Load Operating System option at the main menu begins one of the more-complex MBOOT procedures. From the Load Operating System submenu, you can load, rename, and delete different versions of DOS. Since loading a new version of DOS involves copying files from a diskette, the usual Return Without Changing option is not available on this menu.

MBOOT's ability to load operating systems is limited to adding DOS versions to your disk. (As previously indicated, the program can boot to OS/2, but you must install it with the dual boot option before you install MBOOT.) Several precautions must be observed when you load alternative DOS versions for MBOOT to use in its various sessions.

The first precaution concerns the size of the operating system files. Any version of DOS you load through MBOOT must be physically smaller than the DOS version *currently* installed on your disk. As a rule of thumb, this will present no problem if you simply install the latest version of DOS on the target disk before installing MBOOT. Since each version of DOS has grown in size, the earlier versions will be small enough for MBOOT to overlay on the later version.

When you're adding a new version of DOS to the target disk, MBOOT will prompt you to insert a bootable diskette formatted with the version of DOS to be loaded. MBOOT will then read the boot sector and the operating system files from the diskette and copy them to the target disk. If the target disk is also a diskette, MBOOT prompts you to replace the target disk before copying the system files.

MBOOT copies the two system files as well as the boot record. The files are placed in the root directory of the target disk with the names MBOOTOS_x.BOT, MBOOTOS_x.SYS, and MBOOTOS_x.COM. The *x* is replaced with a number from 1 to 4 to keep track of which operating system files go together. As with MBOOT.SYS, the operating system files are marked Hidden, System, and Read Only.

It is important to note that MBOOT

Reach Heights Others Only Dream Of! CompuAdd Companion™ \$2495



October 16, 1990
Sharp PC-6220
TI TravelMate 2000



1990
— WINNER —
PC Magazine Award
for Technical Excellence



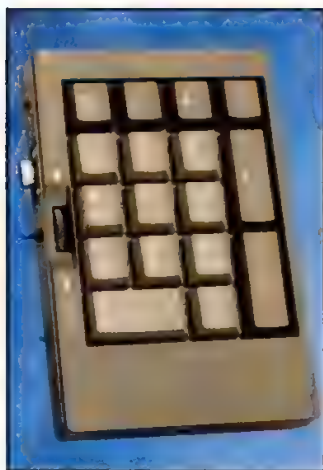
PORTABLES
Sharp PC-6220
TI TravelMate 2000



October, 1990

CompuAdd®
Customer driven, by design.™

CompuAdd Companion™ New Low Price: \$2495



Add on the optional numeric keypad for quick data entry.

No other notebook PC has ever won so many major awards in such a short time!

PC Magazine gave it an Editors' Choice award, October 16, 1990. The editors said, "If you are looking for a laptop machine that can give you everything you need — and spare you a sore shoulder — look no further... One of the most impressive features of these two laptops is their

screens. Anyone who has longed to give presentations on a laptop without having to drag around a monitor will delight in this system."

BYTE magazine's January 1991 issue tagged it with an Award of Excellence, saying, "...several *BYTE* editors consider these portables, all built in the same Texas Instruments plant, to be the best they've ever used. ...These computers are winners."

PC World rated it a Best Buy in October 1990, citing "...mind-boggling portability with unheard-of battery life."

PC Magazine's January 15, 1991 issue added a Technical Excellence award, calling it "...the slickest notebook computer around."

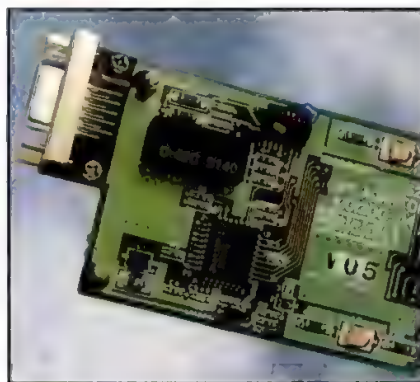
The CompuAdd Companion weighs a mere 4.4 pounds. Yet it houses a power-packed 12MHz Intel™ 80C286 microprocessor supported by 1MB DRAM (expandable to 3MB), sports a 20MB hard drive and has all the features you expect in an advanced-design notebook PC. Plus the CompuAdd Companion gives you a lot more value for your dollar!

Completely AT-compatible, the CompuAdd Companion comes with MS-DOS and LapLink software already installed in ROM. You can easily add performance options via the built-in serial, parallel and numeric keypad ports and a modular expansion port for use with external 3.5" floppy drives, full-sized monitors or fax/modems.

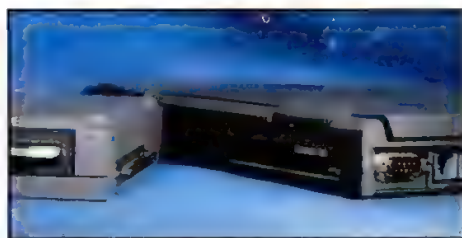
The CompuAdd Companion packs all the power you need to handle sophisticated software applications, such as Lotus 1-2-3™, Harvard Graphics™ and WordPerfect™ 5.1.

You get a package of extras no other company can offer:

- 89 CompuAdd retail Superstores, each a complete sales and service facility
- 30-day, money-back guarantee
- Toll-free telephone support
- On-site service through Memorex/Telex
- Leasing for corporate clients
- Local corporate sales representatives
- Government/Educational sales



Use the CRT - interface option to connect your favorite VGA monitor.



Add a 3.5" diskette drive for work in the office.

CompuAdd the PC Value Leader.

So tie down a CompuAdd Companion. You'll get the full weight of CompuAdd support and service behind you!

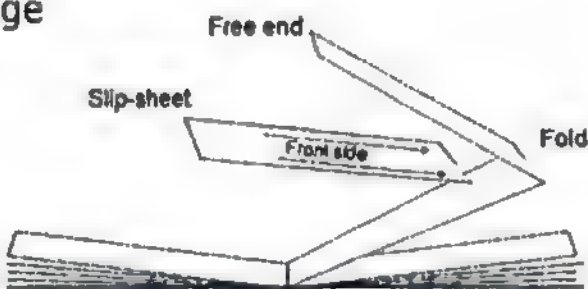
 **Call 800-456-3660** Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

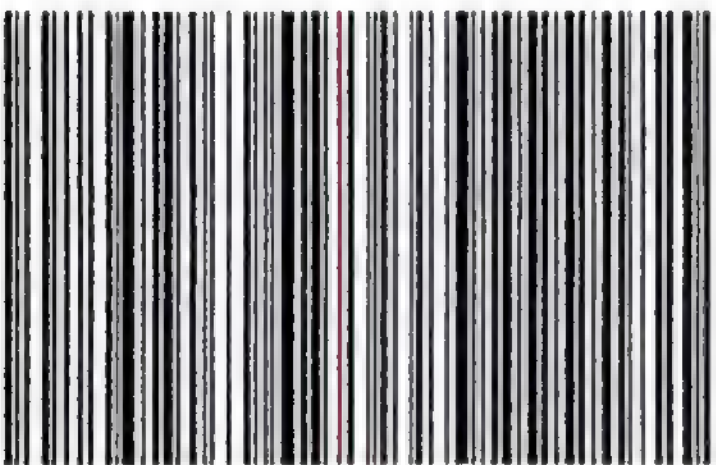
 800-387-3266  95-800-010-0401  0800-373535  0130-6009  140-364-675

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



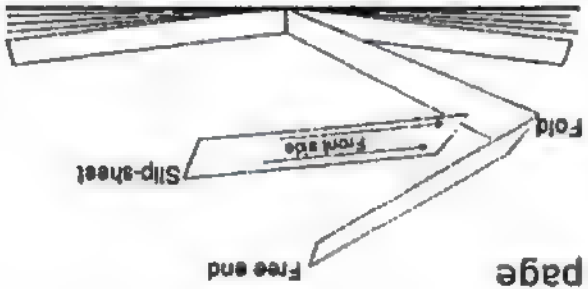
Inverted Foldout slip-sheet



GbsSlipSheet-001

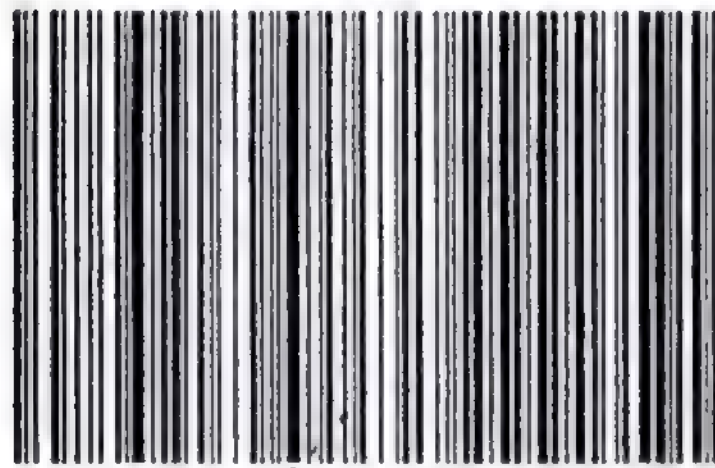
Folded edge of the page

1. Open the foldout page
2. Insert this sheet with
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5llpBack-0018

Back

1. Follow instructions on the other side

C O M P U A D D

The 4.4-Pound Notebook That Sails Above The Competition



CompuAdd Companion™

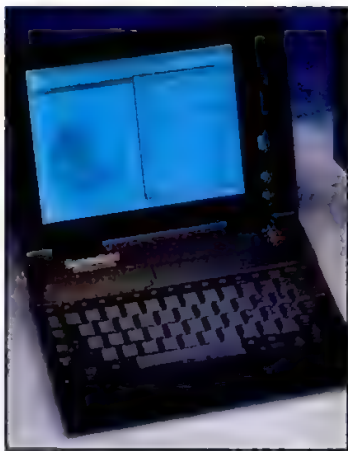
Save \$400! Now \$2495!

Award-Winning CompuAdd Companion

The ultralight 4.4-pound CompuAdd Companion puts the performance of a full-sized computer right in your briefcase! This 286-based notebook computer recently won four major awards: *PC Magazine* Editors' Choice and Technical Excellence awards, *BYTE* Award of Excellence and *PC World* Best Buy.

It comes with MS-DOS 4.01 and LapLinkII data transfer software already installed so you can easily exchange files with a desktop system. Take computing performance and flexibility wherever you go!

Call today for the best deal on an award-winning 286 notebook!



CompuAdd 316SL Laptop

The CompuAdd 316SL — *our hottest seller* — is the perfect on-the-go computing solution! It packs the power of the 386SX microprocessor into a convenient laptop — at a price far below competitive models! Plus you get FREE CompuAdd Windows 3.0, FREE Microsoft Working Models, FREE CompuAdd MS-DOS 4.01, FREE LapLink II communications software and a FREE CompuAdd mouse.

You'll find the crisp, clear VGA display and spacious keyboard a pleasure to use. And if you want to

use your desktop color monitor and expanded 101-key keyboard when you're not on the road, simply plug them into the built-in external ports.

CompuAdd also offers portable printers, projectors and data displays to make your 316SL a complete office on the road! Check out the savings when you buy CompuAdd's 316SL Kit (62203) with Diconix printer and modem/send-only fax.

CompuAdd CompanionSX

The CompuAdd CompanionSX notebook continues the CompuAdd tradition of bringing you the latest technology at incredible savings! Powered by Intel's 20MHz 386SX microprocessor, the CompuAdd CompanionSX puts 386 power in a package less than two inches thick and only 5-3/4 pounds!

Call today for pricing and delivery schedules.

CompuAdd Companion Features

- 80C286 microprocessor running at 6, 8, or 12MHz
 - Standard 1MB DRAM expandable to 3MB
 - 20MB hard disk drive with 23ms access time
 - Dedicated 80C287 math coprocessor socket
 - Built-in serial, parallel printer, numeric keypad, and modular expansion ports can be used for external VGA monitor or modem/fax interface modules
 - High-resolution 640x480 VGA display
 - Crisp 8" x 6" triple supertwist monochrome LCD screen (CCFT sidelit)
 - 79-key keyboard with 101-key emulation
 - MS-DOS 4.01 and LapLink II in ROM
 - LapLink cable
 - Rechargeable/removeable internal battery pack
 - Modular AC adapter
 - Dimensions: 8.5" x 11" x 1.4"
- System Price: \$2495 (62280)**

CompuAdd 316SL Laptop Features

- 386SX microprocessor running at 16MHz
 - Standard 2MB high speed dynamic RAM expandable to 6MB
 - 3.5" 1.44MB high-density diskette drive
 - 40MB hard disk drive with 28ms access time
 - Dedicated internal modem/fax expansion slot
 - Dedicated 80387SX math coprocessor socket
 - Built-in serial, parallel printer, and external VGA monitor, keyboard and 5.25" diskette drive ports
 - High-resolution 640x480 monochrome VGA display with 7" x 5.25" sidelit, supertwist LCD screen
 - 85-key keyboard with 101-key emulation, 12 function keys and 4 cursor keys
 - **FREE!** CompuAdd mouse \$24.95 value
 - **FREE!** CompuAdd Windows 3.0 preloaded \$149 value
 - **FREE!** Microsoft Working Models
 - **FREE!** CompuAdd MS-DOS 4.01 preloaded \$89 value
 - **FREE!** Laplink II
- System Price: \$2895 (62202)**
Kit Price: \$3195 (62203)



CompuAdd®

Customer driven. by design.™



Call 800-456-3660

Key Code 815

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
 12303 Technology, Austin, Texas 78727

Utilities

copies only the DOS system files. Files such as COMMAND.COM and other DOS files you may wish to access (MODE.COM, XCOPY.COM, FORMAT.COM, and so on) must be copied to the target disk separately. All the files for a given DOS version should be kept together in a separate version directory, and the relevant AUTOEXEC.BAT file should include a path statement that points to this directory. Similarly, the SHELL statement in the appropriate CONFIG.SYS file should also point to the COMMAND.COM file in this directory.

To illustrate, if you install a copy of DOS 3.3 using MBOOT, you should create a DOS33 directory that contains all files needed for DOS 3.3, including its version of COMMAND.COM. The CONFIG.SYS for use with these files should contain a SHELL statement with the syntax

```
shell=c:\dos33\command.com /p
```

The AUTOEXEC.BAT file for this session should contain a COMSPEC statement with the syntax

```
set comspec=c:\dos33\command.com
```

While MBOOT can install almost any version of DOS on a disk, this does not mean that any DOS version will work. The problem lies in what hardware the different versions of DOS can support. Users should not attempt to install a version of DOS on hardware that that version cannot support. For example, DOS 3.2 will recognize PS/2 hard disks. DOS 3.3 cannot read hard disks with partitions greater than 32MB.

When adding additional DOS versions, remember that each may require a slightly different syntax for its commands. The DOS manual for each version will alert you to such idiosyncracies.

MBOOT uses the OEM identification field of the boot record to hold the name of the operating system. Since this field is often not very descriptive of the DOS version, MBOOT lets you change it. The eight-character operating system name can be changed by selecting the Change Operating System Name option from the Load Operating System menu.

An operating system can be removed

using the Delete Operating System option on the Load Operating System menu. As with the load operation, this will handle the system files but not those you have put in a separate version directory. Of course, you cannot delete the operating system currently in use.

Having come so far in the MBOOT installation process, you're now ready to select the Install MBOOT option at the main menu. This procedure replaces the current boot record on the target disk with the MBOOT boot record. The file MBOOT.SYS, containing both the code to bring up the boot menu and the data for each session, will automatically be created in the root directory. All system files that MBOOT creates are marked with Hidden, System, and Read-Only flags, so they won't be visible in normal directory listings. The current DOS system files and boot record are copied into files with the names LASTBOOT.BIN, MBOOT-OS1.SYS, and MBOOTOS1.COM.

If you wish at any time to uninstall MBOOT, simply select the Remove MBOOT option from the main menu. MBOOT will replace its own boot record with that of the current operating system. The boot extension file, MBOOT.SYS, will be erased, as will any operating system files MBOOT has created. The DOS version currently active at the time MBOOT is uninstalled will become the installed DOS version.

As with most of the submenus, the main menu for MBOOT lets you either Update Changes and Exit or Quit Without Changing. The former incorporates all changes made into the installed code since you started the program. If the program

has not been installed, MBOOT asks you whether the program should be installed. The Quit Without Changing option terminates the program without incorporating any changes you have made. In order to prevent unintentional loss of the modifications you have made, this option requires confirmation before returning to DOS.

HOW DOES MBOOT DO IT?

To understand how MBOOT works, it's necessary to examine the sequence of steps an IBM-compatible PC follows when it boots up. The process is not complex, but it follows very strict and unforgiving rules.

Booting is the process of loading the operating system of a computer. The verb *boot*, of course, is short for *bootstrap*, as in what you pull yourself up by. IBM PCs actually have two different boot procedures, a *cold* boot, which is used when the PC is first turned on, and a *warm* boot, which is initiated when the Ctrl, Alt, and Del keys are simultaneously pressed.

When the PC is booted, a start-up program contained in the Read Only Memory (ROM) part of the Basic Input Output System (BIOS) is the first program to run. This program checks to see whether the computer has just been turned on. If so, a cold boot is required, and a series of tests (the power-on self test, or POST) is run to check that the machine is ready to perform reliably.

Once the computer has completed its self test, it looks to see whether a disk is loaded in the A: drive. If not, the C: drive is checked. On IBM PCs and PS/2 systems, if no valid disk is found, the system loads cassette BASIC.

To determine whether a properly for-

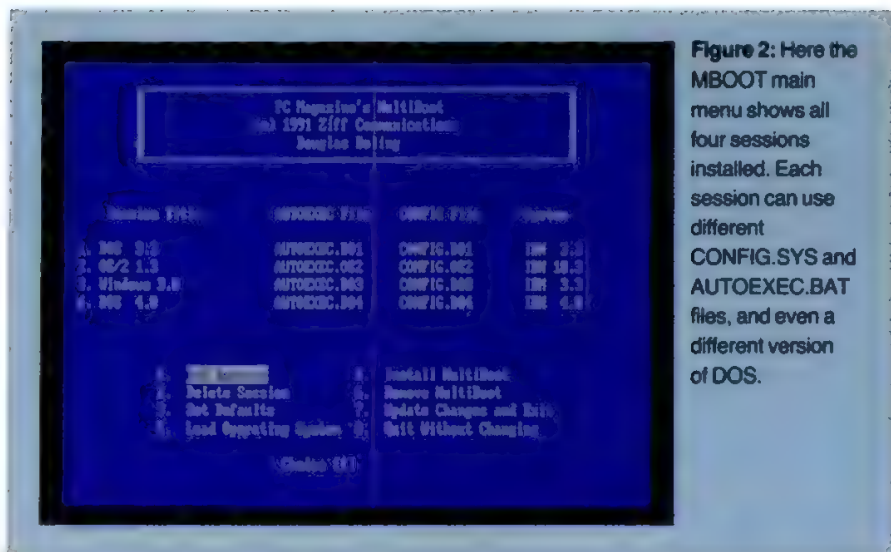


Figure 2: Here the MBOOT main menu shows all four sessions installed. Each session can use different CONFIG.SYS and AUTOEXEC.BAT files, and even a different version of DOS.

Utilities

matted disk is present, the BIOS reads the first sector of the disk into RAM at location 0:7C00h. If the data in that sector begins with a byte whose value is EB or E9 and ends with the word AA55, the BIOS assumes the disk is valid. If the test passes, the BIOS loads register DL with the number of the drive booted and jumps to the first byte of the boot record.

The EB and E9 values were not chosen at random: they represent the codes for a jump instruction in Intel 80x86 processors. The AA55 code—2 bytes that contain alternating 1 and 0 bits—is a standard code used as a flag by assembly language programmers.

If a boot record is found, there is still no guarantee that the disk is bootable—that is, that it contains a copy of the operating system. Indeed, *all* DOS and OS/2 disks have a boot record like this stored in the first sector of the disk. It thus becomes the responsibility of the boot record to determine whether an operating system is on the disk and, if it is present, to load it into memory.

Both DOS and OS/2 boot records start by finding and loading the root directory table into memory. At this point, however, the procedures for the two operating systems begin to differ.

The DOS boot record code searches the first two locations in the root directory for the files IO.SYS and MSDOS.SYS (IBMBIO.COM and IBMDOS.COM for PC-DOS). Unless both of these files are found, the boot record displays the familiar error message, "Non-System disk or disk error." The boot record then waits for a key to be pressed and automatically reboots the system.

If the DOS system files are found, IO.SYS (or IBMBIO.COM) is loaded into memory. The boot record code assumes that this file is stored in contiguous sectors on the disk. The bootstrap loader transfers control to the beginning of the memory occupied by IO.SYS.

IO.SYS is responsible for querying the system to determine what hardware is present on the machine, for initializing the resident device drivers and for loading and initializing MSDOS.SYS (or IBMDOS.COM). The initialization routines are used only at boot time and are discarded when MSDOS.SYS initialization has been completed. The resident part of

MSDOS.SYS contains the standard DOS routines, such as file-open and file-read, that programmers are so intimately familiar with.

MSDOS.SYS (IBMDOS.COM) runs through its standard list of resident device drivers (for example, the CON, AUX, and LPT1 drivers) in sequence, calling the initialization routine for each. The CONFIG.SYS file is then read from the root directory of the disk in order to load any user-supplied device drivers. The CONFIG.SYS file also contains various statements that configure some of the internal DOS structures, such as the number of buffers to be reserved for program operations.

When this initialization is finished, the "shell" program—usually COMMAND.COM—is loaded. COMMAND.COM is simply a DOS program that provides the interface between the DOS routines and the user. It also provides the familiar C:> prompt. COMMAND.COM reads and executes the AUTOEXEC.BAT file, which allows final user-configuration of the system. At this point the system-boot process is completed.

Booting OS/2 is a different and somewhat cleaner process. The OS/2 boot record searches the root directory of the disk for the file OS2LDR. This file is not restricted to any specific location on the disk, though it must be contained in contiguous sectors.

OS2LDR is a rather sophisticated program loader. OS2LDR is responsible for loading the main OS/2 operating system file, OS2KRNL, into memory. Once OS2KRNL is loaded, it initializes itself and the system enters protected mode and

loads the OS/2 shell program—normally the Presentation Manager graphical user interface.

THE THREE PARTS OF MBOOT

The key to MBOOT's operation is that it gets ahead of the boot process by replacing the DOS boot record with a custom boot record of its own. By deciphering the BIOS parameter block (BPB) in the boot record and using BIOS calls, MBOOT can manipulate the data on the disk before DOS or OS/2 has a chance to load.

MBOOT.COM is functionally divided into three parts: the boot record, the extended boot record, and the installation code. MBOOT uses parts of its file to create its disk boot record and its extended boot record, MBOOT.SYS.

The boot record part of MBOOT simply replaces the DOS boot record that was created when the disk was formatted. (The old boot record is saved in a file to be used when MBOOT has completed its work.) MBOOT.SYS holds the code that won't fit in the size allowed for the boot record. The installation code provides the configuration menus for setting up each of the four sessions.

The MBOOT boot record is written to the first sector of the boot disk and is quite similar to the standard DOS boot record it replaces. The boot code finds and loads the root directory table. The root is then searched for the file MBOOT.SYS, which contains the extended boot code. If MBOOT.SYS is found, the first sector of the file is read into memory at the location of the original boot record, 0:7C00h.

If the MBOOT.SYS file is not found, the saved boot record of the current system

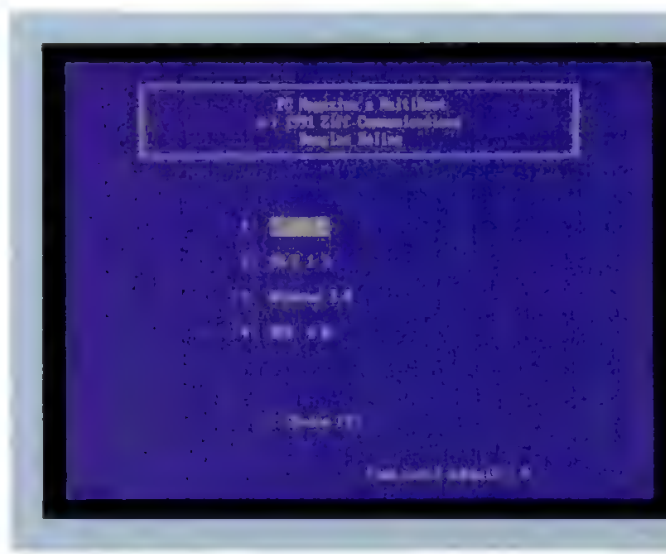
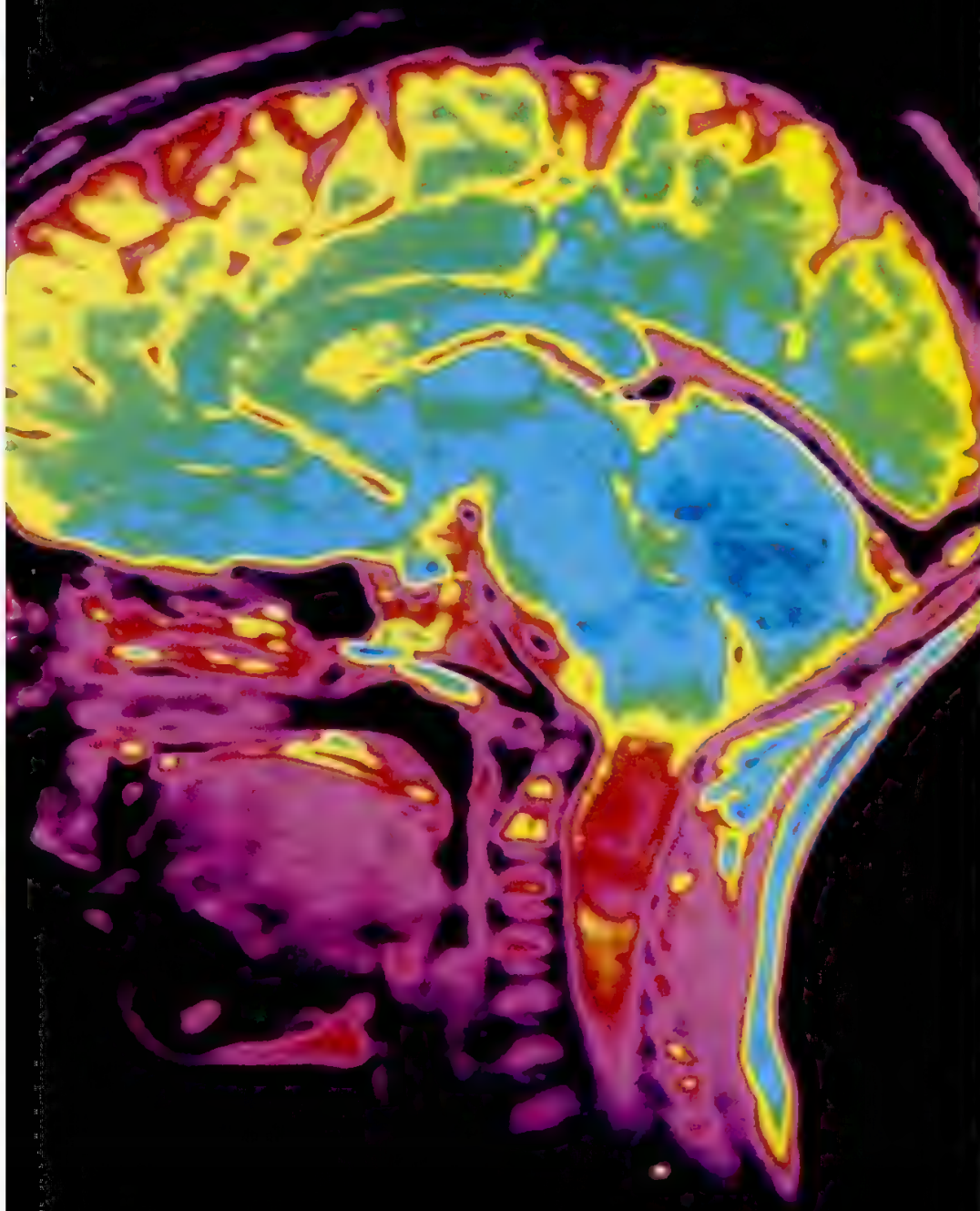


Figure 3: You access this menu when you select option 4, Load Operating System, from the main menu. The timeout value, displayed in the lower-right corner, specifies the amount of time you have to select a session. If you don't choose one, MBOOT will install the default system.

At Mount Sinai Hospital,
some of the best brains in the
country rely on Sony.



Fortunately, critical patient data
is tucked into the safest place of all.
A Sony data cartridge.

In fact, hundreds of detailed files
can be accessed from one, single,
solitary data cartridge.

Which is how the renowned
doctors at Mount Sinai Hospital
in New York City store patient
diagnostic data.

Not one byte can be lost.

That's why Sony produces, with
exacting care, a range of mini and
ultra-high capacity data cartridges
up to 525 megabytes.

And if Sony data cartridges can
do all of this, they can also back up
another vitally important life force
with the utmost integrity.

Your business operations.



SONY.

CIRCLE 337 ON READER SERVICE CARD

Only Epson can printing this



Adobe and PostScript are registered trademarks of Adobe Systems, Inc. AppleTalk and Macintosh are registered trademarks of Apple Computer, Inc. HP and LaserJet are registered trademarks of Hewlett-Packard, Inc.

ould take laser far, this fast.

All it took was a little RISC.

Introducing the Epson® EPL-7500 laser printer. One of the first true Adobe® PostScript® laser printers designed around a lightning-fast RISC processor.

The result is *significantly* faster output.

It is also *significantly* better.

Thanks to true Adobe PostScript — not a clone — the EPL-7500 is able to produce razor-sharp text in 35 scalable fonts, plus equally impeccable graphics. Blacks are blacker and lines are finer, courtesy of the printer's unique MicroArt Printing technology.

The EPL-7500 handles paper as well as it handles text and graphics. A 250-sheet tray comes standard, a second is optional. Also standard are serial, parallel and AppleTalk® interfaces, allowing the printer to work smoothly in both PC and Macintosh® environ-

ments. For even greater versatility, HP® LaserJet® Series II emulation is included.

Of course, not everyone needs a PostScript printer. That's why the Epson laser line also includes the new EPL-7000. Like the EPL-7500, it offers brilliant MicroArt Printing, superior paper handling and HP compatibility. Plus a host of other serious business features, all loaded into an extremely affordable package. Moreover, the EPL-7000 even allows upgradability to the EPL-7500's true PostScript and RISC processing.

With the EPL-7500 and EPL-7000, the engineers of Epson have succeeded in raising the standards for laser printing. Without raising the price.

In fact, a demonstration will quickly and clearly show you why these are the most innovative printers in their class. By far.



The new Epson EPL-7500 laser delivers brilliant PostScript output at blazing RISC processing speeds.

The new EPL-7000 provides serious business performance at a very personal price.



Engineered For The Way You Work.™

EPSON

Utilities

is loaded at 0:7C00h. MBOOT jumps to the start of the boot record just as if the BIOS had completed the process. This allows the system to boot, even if the MBOOT.SYS file has been erased.

If neither MBOOT.SYS nor the old boot record is found, the MBOOT boot record displays an error message and waits for you to reboot. If you ever encounter this error, restart the system from a bootable floppy disk.

The work of displaying the boot menu and booting the proper operating system is performed by the extended boot code located in the file MBOOT.SYS. Owing to the restricted size of the 512-byte boot record, the boot record loads only the first sector (512 bytes) of MBOOT.SYS into memory. Since MBOOT.SYS is larger than the one sector, its first job is to load the remainder of itself into memory.

Normally, programs would simply use DOS to read files from the disk. Since the extended boot code is run before DOS is loaded, however, MBOOT.SYS must contain its own routines to read, write, and rename files on the disk.

To load itself into memory, the extended boot code first reads the file allocation table (FAT) into memory. The FAT is a table whose entries detail the contents of each cluster on the disk. (A cluster is a group of sectors that hold part of a file.) Both DOS and OS/2 use this table to determine the location of file data.

Each directory entry contains a pointer to a FAT entry that indicates the location of the first cluster of data for that file. Each entry in the FAT either points to another entry in the FAT—indicating that the next part of the file resides there—or contains the value 0FFFh (0FFFFh in 16-bit FATs). The latter indicates that this is the last entry for the file.

Since there is a FAT entry for each allowable data cluster on the drive, locating the data for a FAT entry is simply a matter of using the index into the FAT as a count of the number of clusters from the start of the disk. Subsequent clusters are loaded by following the chain in the FAT and reading the corresponding cluster.

As indicated earlier, OS/2, Version 1.2, provides the option of using the new High Performance File System (HPFS). Before installing itself, MBOOT checks to see whether the disk is a FAT type disk or

an HPFS disk and will not attempt to install on the latter.

When the remainder of the extended boot record is loaded, the menu containing the boot choices (see Figure 3) is displayed. If a time-out value has been specified, it is shown in the lower-right corner of the screen. If you don't select a choice within the time-out period, the extended boot record will use the default session. The time-out is disabled if you press any valid key to change the selection.

The menu routine uses the cursor and Tab keys to move the selection bar. Each item can also be selected by entering the number of the menu item. The Enter key returns the selected menu number to the calling routine. The Esc key also returns

To ensure compatibility with as many machines as possible, MBOOT uses BIOS calls to write to the screen.

the selected item but sets the carry flag to indicate that it is the key that was struck.

To ensure compatibility with as many machines as possible, MBOOT uses BIOS calls to write all characters to the screen. While this method is much slower than writing directly to the screen buffer, compatibility is more important than speed in a program such as this.

After you've selected the session, MBOOT checks to see whether your choice has changed since the last time the system was booted. If you use the same session, MBOOT simply loads the saved boot record for that operating system and jumps to it. The old boot record is responsible for loading the operating system.

If the session selected is different from that used for the previous boot, MBOOT must replace the current AUTOEXEC and CONFIG files with those you have specified for the newly selected session. To replace the files, MBOOT uses the number of the previous boot session as an index into a table that contains the names used when the session is nonactive. The previ-

ous AUTOEXEC and CONFIG files are then renamed to their nonactive names. If either of the files is not found, the names in the session table are deleted.

Using the new session number, MBOOT then finds the names of the appropriate AUTOEXEC and CONFIG files. These files are then renamed as AUTOEXEC.BAT and CONFIG.SYS.

After renaming the files, MBOOT checks to see which operating system is used for the selected session. If the operating system is the same as the previous boot, no action is taken. Otherwise, the new operating system is loaded.

Loading a different version of DOS is more complicated than simply renaming files. DOS requires that its system files be the first two files on the disk and that both files be stored in contiguous sectors located at the start of the disk data area.

Since the DOS system files must be at a specific location on the disk, then, the system files for a new DOS version must be written over the current system files. Moreover, to ensure compatibility, the boot record for each version of DOS must be used to boot that specific version. The DOS system files for each installed version are kept in three files in the root directory. These files all begin with the letters MBOOT and are marked with Hidden, System, and Read-Only attributes.

Since the size of the system files for each DOS version varies, some unused clusters may remain after the new files have been copied. Since these clusters will be needed the next time the larger DOS is loaded, they cannot simply be marked "unused;" then they would get assigned to other files. Therefore, MBOOT marks these clusters as "bad" to prevent them from being reassigned.

MBOOT records the size of the IO.SYS and MSDOS.SYS (IBMBIO.COM and IBMDOS.COM) files and saves these values in the extended boot code of MBOOT.SYS. These values are used to compute how many "bad" sectors must be written at the end of the smaller version of DOS. Truly bad sectors appear only at the end of the IBMBIO or IBM DOS files, and MBOOT checks for them.

Booting OS/2 is a much simpler procedure and does not require the file gymnastics needed to change versions of DOS. The OS/2 system files, OS2LDR and OS2KRNL, can be located anywhere in the root directory. To boot OS/2, MBOOT simply loads the OS/2 boot record and jumps to the proper entry point. The OS/2

PC UTILITIES UPDATES

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. The only way to obtain the modified versions is to download them from PC MagNet. A partial list of the programs that have been upgraded follows:

ALIAS.COM, Version 1.1
ANSI.COM, Version 1.3
BAT2EXEC.COM, Version 1.3
BCOPY, Version 1.2
BEN55.ARC (Benchmark Series, Version 5.5)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.2
CMDEDIT.EXE, Version 2.1
CONFIG.CTL, Version 3.0
CONVERT.COM, Version 1.1
DIRMATCH.COM, Version 2.0
EMMA.COM, Version 2.2
EMS40.SYS, Version 1.1
LASERLST.COM, Version 1.1
LITES.COM, Version 1.1
LOG.COM, Version 1.1
MONO.COM, Version 1.1
MOUSE.CTL, Version 1.1
PANDORA.COM, Version 1.5a
PCACCESS.COM, Version 1.1
PCMANAGE.EXE, Version 1.1
PCREMOTE.COM, Version 1.1
RN.COM, Version 2.0
SCHEDULE.COM, Version 1.1
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
TPFST-AT.COM, Version 1.1
ZCOPY.COM, Version 1.2

For a complete list of all the programs available from the PC MagNet Utilities Database, download UDCAT.ARC.

A downloadable index to *PC Magazine's* product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine Reviews Index* for January 1988 to June 1990. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files.

Photocopy this page. Trim and hole-punch the copy and add it to your manual.



Douglas Boling

MBOOT Command

February 26, 1991 (Utilities)

Purpose:

Permits selection at boot-up of up to four configurations (sessions), each of which may use a different CONFIG.SYS, AUTOEXEC.BAT, and version of DOS; one session may use OS/2. MBOOT provides adjustable timeout for a default session and menu-driven installation and selection procedures.

Format:

MBOOT d:

Remarks:

MBOOT must be installed on a boot drive or diskette, so *d:* is normally limited to C: or A:. The various sessions are initially set up through a conventionally controlled menu system before MBOOT itself is finally installed with the Install menu option. MBOOT replaces the normal DOS boot record on the disk and gains control so that it can rename and write the needed DOS system files to their required locations in memory. MBOOT also renames the appropriate user-prepared CONFIG.x and AUTOEXEC.x files, all of which must be stored in the root directory, to CONFIG.SYS and AUTOEXEC.BAT for the specified session.

The largest (latest) version of DOS to be used should be installed on the PC before installing MBOOT. Subsequent DOS versions may then be added from MBOOT's Load Operating System menu. Other version-specific DOS command files, including COMMAND.COM, must be kept in separate directories for each DOS version. The user-prepared CONFIG.x and AUTOEXEC.x files must each contain a line to specify this directory. Thus, assuming a boot drive C: with a \DOS32 version directory, the root directory CONFIG.32 file should contain the line

```
SHELL=C:\DOS32\COMMAND.COM /P
```

and the root directory AUTOEXEC.32 file should contain

```
SET COMSPEC=C:\DOS32\COMMAND.COM
```

If OS/2 is to be used for one of the sessions, it must be installed with its own procedure and with its dual-boot option. MBOOT is then installed from DOS and not from the OS/2 DOS Compatibility Box. Note that MBOOT cannot be installed on a machine using the new OS/2 HPFS (High Performance File System) format.

Note:

Back up your hard disk before installing MBOOT. While it has been successfully tested on a variety of machines, this precaution should be taken with any program, such as MBOOT, that writes to the boot sector of the disk.



LANTastic's™ tiny RAM now has more cards to play with.

If the presence of Micro Channel machines has ever stood between you and the joy of running the award-winning LANTastic PC Network, this is your lucky day. Artisoft has just added three new Micro Channel adapters to its compliment of AE-2 Ethernet, 2Mbps and Voice adapters.

LANTastic AE-2 MC Ethernet for Micro Channel, a 16-bit adapter that can be used in either a 16-bit or a 32-bit slot, is in 100% compliance with IEEE 802.3 and Ethernet standards, and comes with on-board 16K RAM that is user expandable to 64K. Since

AE-2 MC Ethernet is software compatible with Novell's NE/2000 hardware, you can run Novell "out of the box."

LANTastic 2Mbps MC adapters



are the perfect way to economically network small or midsize businesses with Micro Channel computers. Each card includes a 10Mhz coprocessor and 32K of on-board dual-ported RAM, along with software-selectable IRQ and RAMBASE address settings. Artisoft's version of the NetBIOS standard can be loaded into and executed within the adapter. This plunges the NetBIOS draw on a PC's base RAM down to just 2K and off loads the network processing onto the adapter. The cards are easy to install and use inexpensive dual-twisted pair cable.

LANTastic Voice MC adapters let you save sound and speech onto disk for playback later on Micro Channel machines. Use them with LANTastic NOS 3.0 or above, and



you can send voice messages across your LANTastic network. Just pick up the telephone handset provided with each Voice Adapter, bring up a handy on-screen menu, and talk. Use Voice Chat to carry on a real time conversation, or save the message for playback later in your own voice — either through the handset or through the Micro Channel machine's internal speaker.

Now it's easier than ever to run LANTastic's award-winning Network Operating System on Micro Channel machines. Call 602-293-6363 or fax 602-293-8065.



ARTISOFT
Revolutionizing Connectivity

CIRCLE 254 ON READER SERVICE CARD

©1990 ARTISOFT. LANTastic is a trademark of Artisoft. Micro Channel Architecture is a trademark of International Business Machines Corporation.

Utilities

boot record takes care of everything else.

The last task MBOOT performs before jumping to the operating system boot record is to update the boot data table in MBOOT.SYS. This table contains all the information needed to boot each of the sessions, including a list of the filenames to be renamed to AUTOEXEC.BAT and CONFIG.SYS, a list of the operating system filenames, and variables that indicate the last session and operating system booted.

THE OTHER PARTS OF MBOOT

The installation part of MBOOT simply checks for previous installations, allows session configuration using the menu routine, and installs and removes the program.

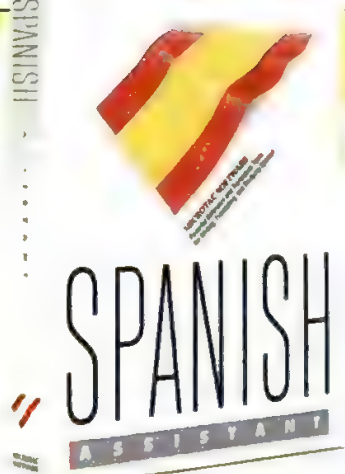
The boot sector of the target disk is read to see whether MBOOT is currently installed. If the MBOOT boot record is found, the MBOOT.SYS file is read and loads the current configuration. If the boot record is a standard DOS or OS/2 boot record, the disk is searched for the proper system files. If these are not found, MBOOT terminates with a message indicating that the drive or disk is not bootable.

The installation code is divided into routines for each of the eight choices on the main menu. Even the Exit and Quit choices use subroutine calls. If these routines determine that the program should terminate, a flag is returned in AL.

The main menu routine is entered and continues until one of the exit options is selected. Each option on the main menu is implemented by a routine that centers on another call to the submenu procedure. Most of the option routines copy the data from the boot table to local buffers so that local changes will not affect the program data. This is what allows you to quit the option without changing the original data.

The turbulent competition for ever more powerful programs and operating system extensions has brought us to the point where the single configuration for which the PC was designed is inadequate. By allowing multiple configurations on one machine, MBOOT restores the freedom we once had to use any application we wanted without being restricted to the decision any single software developer thinks is best for all of us. ■

Douglas Boling is a contributing editor of PC Magazine.



SPANISH
ASSISTANT

A Great Deal In Any Language!

- ▶ Pop up reference help from within the integrated text editor or your word processor
- ▶ Works with standard ASCII files
- ▶ Comprehensive reference tools
- ▶ Easy accented character entry

Only \$79.95—Order Today!
Call Toll Free (800) 366-4170

At only \$79.95 each, the Language Assistant Series translates into a great value. Guaranteed to be the most useful translation tool you've ever used—or your money back. Order your copy now! Call (800) 366-4170.



FRENCH ITALIAN GERMAN

MICROTAC SOFTWARE
4655 Cass St., Suite 214, San Diego, CA 92109
Phone: (619) 272-5700 • Fax: (619) 272-9734

CIRCLE 511 ON READER SERVICE CARD



PS/2[®] MEMORY

Introducing OS/RAM32™

- ✓ 8 Mbytes of fast 32 bit memory.
 - ✓ Works in all Micro Channel™ computers.
 - ✓ Fast LIM 4.0 driver included.
 - ✓ Provides extended and expanded memory.
 - ✓ Easy switchless installation.
 - ✓ Automatic configuration for DOS, OS/2 or UNIX.
 - ✓ Risk free guarantee. Two year warranty.
 - ✓ Accepted under IBM service contracts.
 - ✓ From \$299 to \$998 with 8 Megabytes.
 - ✓ "Best price performance", says PC Week.
- Call today 617-273-1818 or 1-800-234-4CEC



Capital Equipment Corp.
Burlington, MA. 01803

PS/2 and Micro Channel are trademarks of IBM

CIRCLE 128 ON READER SERVICE CARD



PC MagNet News

The Latest Files and Features of PC Magazine's On-line Service

Tutorial: How to Extract ARC/ZIP Compressed Files

Have you ever wondered what the .ARC or .ZIP file extensions mean?

An .ARC or .ZIP file contains one or more related files compressed together into an archive in order for them to be downloaded alone rather than in several separate files. Many of the files on PC MagNet are offered in this format because it saves on download time, while helping to protect the integrity of the compressed files.

To use an .ARC file once it's downloaded, you must extract the individual files within it. If you download ARCE.EXE from PC MagNet's Utilities Database (or from DL2 in the Utilforum/Tips Forum) and run ARCE at the DOS command line, you'll get an unarcng program called

ARCE.COM along with the documentation file. If you then type ARCE, followed by the name of the ARC file, you'll be able to extract the compressed files.

.ZIP files also require a separate program to extract the files inside of it. UNZIP2.COM is a self-extracting file archive that contains the source and executable for UNZIP.EXE. After running UNZIP2, simply run as UNZIP followed by the file to be unzipped. This program will unpack even the newest file archives created with PKZIP, Version 1 or 1.02, with its new imploding scheme.

Both Vern Bueg's ARCE.EXE and Samuel Smith's UNZIP2.COM are freeware; the authors make them available for use on PC MagNet.

Bountiful WordPerfect Macros

For those of you dedicated to WordPerfect 5.1, a useful macro shareware collection is a scant download away. WPMAC516.ZIP and its information file WPMAC-516.INF contain a selection of over 100 WordPerfect Ctrl-key, Alt-key, and character-named macros covering every chore imaginable. Network compatibility, an easy help menu, and selective installation bring this extensive macro collection to must-have status for WordPerfect 5.1 devotees.

Available for a \$10 shareware fee from author Alan Kaplan, the new Version 6 is WPMAC516.ZIP in DL15 of our UTILFORUM.

Sally Neuman: MagNet SysOp

In the coming issues, we will try to familiarize our users with our helpful on-line Systems Operators (SysOp).

Sally Neuman [72241,66] is one of five volunteer SysOps in our Tips Forum. In the real world Sally runs a home-based small systems integration business that serves a large client base in Oregon and Washington. She is a beta tester for WordPerfect, Ashton-Tate, and Central Point Software and is happy to help PC MagNet users with product questions. She brings 16 years of experience in systems administration and computer end-user training and support to her post as a PC MagNet SysOp.

- **ARC/ZIP:** A Quick lesson on how to extract archived files.
- **WPMAC516.ZIP:** Superior collection of WordPerfect 5.1 macros.
- **SALLY NEUMAN:** PC MagNet SysOp in the Utilforum.

Instant Access to PC Magazine's On-line Service

PC Magazine operates a 24-hour-a-day interactive dial-up service where readers can find the utilities published in every issue, download an index of all product reviews, share opinions with the editors, and gain access to Computer Library and Consumer Reference Library.

How to Subscribe Right Now!

You can join PC MagNet with one phone call.

1. Choose a phone number by following the directions under "Finding the Number in Your Town" (below).
2. Set your communications software to 300, 1,200, or 2,400 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex.
3. Dial the local number. When you connect, type Ctrl-C.
4. At the HOST NAME prompt, type CIS.
5. At the USER ID prompt, type 177000,5000.
6. At the PASSWORD prompt, type PC*MAGNET.
7. At the ENTER AGREEMENT NUMBER prompt, type Z10D9100.
8. Register your name and enter your MasterCard, Visa, or American Express card number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.)
9. Your personal User ID and Password will be displayed at the end of the registration process. Record them for logging on over the next few days; a new password will arrive in the mail within ten days to confirm your subscription.

There are no up-front subscription charges; you pay only for the time you spend on-line. CompuServe members can join by entering GO PCMAG at any CompuServe "!" prompt. CompuServe Customer Service can be reached at 800-848-8990. Outside the United States, call 614-457-8650.

PC MagNet costs \$12.80 an hour for 1,200- or 2,400-bps service, or \$6.30 an hour for 300-bps service. Billing is based on 1-minute increments.

Finding the Number in Your Town

Using your modem: Dial 800-346-3247. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

Using voice: Dial 800-635-6225. Follow the instructions and note the number.

by
Charles Petzold

Environments

Traditionally, a *palette* is a board on which a painter mixes colors, but it can also refer to the entire range of colors that an artist uses in creating a painting. In computer graphics, the term *palette* refers to the range of colors available on a graphics output device, such as a video display. Some people use the word to refer to the range of colors available simultaneously, while others use it to refer to all the colors that the output device can render.

For video displays, these two ranges of color are often different. For example, the IBM Enhanced Graphics Adapter (EGA) is capable of displaying 16 simultaneous colors, but these colors can be selected from 64 different color choices. The IBM Video Graphics Array (VGA) also displays only 16 simultaneous colors in the 640-by-480 mode, but these can be selected from among 262,144 (2^{18}) different colors. The IBM 8514/A and some Super VGA adapters can display 256 simultaneous colors, also selected from 262,144 available colors.

The number of colors that a video board can simultaneously display depends on the amount and organization of buffer memory on the board. The total range of colors depends on the video board's palette lookup table and how the video board drives the monitor, as I discussed in the December 11, 1990, installment of *Environments*.

In versions of *Windows* prior to 3.0, the device driver for the video board set the board's palette lookup table. Applications were stuck with the 8, 16, or 256 colors the authors of the device driver selected. Colors beyond these were available only through the process of dithering, and then only for area filling.

In *Windows* 3.0, device drivers for video boards that support more than 16 colors can allow applications to change the video board's palette lookup table. A whole set of new functions (collectively called the *palette manager*) is available for this purpose. In this column, we'll begin looking at the *Windows* 3.0 palette manager.

An Introduction To the Windows 3.0 Palette Manager

■ Beginning in *Windows* 3.0, new functions that allow applications to change a video board's palette lookup table are available. These new functions are known collectively as the *palette manager*.

PALETTES AND WINDOWING

Graphics programs that don't use *Windows* or the OS/2 Presentation Manager generally access video hardware directly. It's usually not a big job for these programs to access the ports of the video hardware and change the palette lookup table. (The

downside is that the method for doing this usually changes with each new generation of video board.)

In *Windows*, however, programs don't directly access video hardware. The *Windows* Graphics Device Interface (GDI) is designed so that programs can use the video hardware in a device-independent manner. A *Windows* palette manager must include functions that allow applications to change the palette lookup table through these device-independent functions.

So far, so good. But in a windowing environment, you can have several programs running side by side. Changing the palette lookup table presents a problem because the palette table affects all of the currently running programs.

For example, say you have a video adapter, such as the 8514/A, that's capable of displaying 256 simultaneous colors.

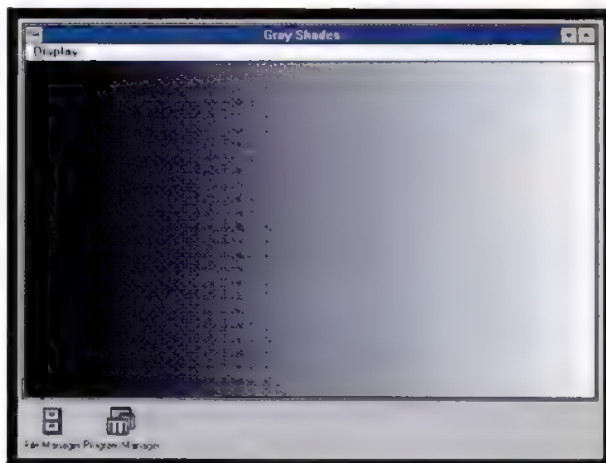


Figure 1: The GRAYS program uses the *Windows* 3.0 palette manager to display 65 shades of gray ranging from black to white. This shows what it looks like when running on a VGA.

Environments

Now suppose one program running under *Windows* wants 64 pure shades of gray, another wants 64 pure shades of blue, another wants 64 pure shades of green, another wants 64 pure shades of red, and yet another wants 64 pure shades of cyan. That's a total of 320 colors. There's no way all of these programs can run side-by-side and get the colors they want.

Windows 3.0 solves this problem by giving highest priority to the active window. The active window is the window with the highlighted title bar that appears on top of all the other windows. We'll examine how this works in the context of a simple sample program.

DISPLAYING GRAY SHADES

The GRAYS program I'll discuss in this issue uses the *Windows* 3.0 palette man-

ager to display 65 shades of gray as a "fountain" of color ranging from black to white. If you run the GRAYS program on a VGA, you'll see something like the screen shown in Figure 1.

The VGA is limited to 16 simultaneous colors, and many of these must be used for system colors—for title bars, scroll bars, menus, and so forth. Current device drivers for 16-color video adapters don't let you change the palette table. (In the future, I'll show you how to override this restriction.) What we see here is 65 shades of gray, but almost all of them are rendered using dithering—various pixel combinations of black, dark gray, light gray, and white. If we were displaying lines or text, rather than filled areas, using these 65 gray shades, *Windows* would use only pure colors.

By default, when you run the GRAYS program on an 8514/A, it also uses dithering, as shown in Figure 2.

However, with the appropriate menu

selection, you can tell the program to use the palette manager. When you do, the program displays 65 pure shades of gray, as shown in Figure 3.

These 65 pure gray shades could also be used for drawing lines or text. (Unfortunately, the halftone process used in printing screenshots in this magazine may obscure the difference between Figures 2 and 3, a difference that's very clear when you see the program on an 8514/A.)

THE GRAYS SOURCE CODE

The source code for GRAYS is shown in Figures 4 through 8. The program demonstrates the most important palette manager functions with very little extraneous code. If you have the *Windows* 3.0 Software Development Kit and the Microsoft C 6.0 Compiler installed, you can create GRAYS.EXE by executing

```
MAKE GRAYS.MAK
```

Or you can download GRAYS.EXE and all the source code files from PC MagNet.

CREATING THE LOGICAL PALETTE

To use the palette manager, generally you'd first create a logical palette by calling the `CreatePalette` function. This function is new in *Windows* 3.0. GRAYS takes care of this during the `WM_CREATE` message to the `WndProc` window procedure. A window procedure receives this message when the window is first created.

During the `WM_CREATE` message, `WndProc` initializes the fields of a `LOGPALETTE` (logical palette) structure and passes a pointer to this structure to the `CreatePalette` function. `CreatePalette` returns a handle to the logical palette, which is stored in the static variable `hPal`. `LOGPALETTE` is defined in `WINDOWS.H` as

```
typedef struct
{
    WORD        palVersion ;
    WORD        palNumEntries ;
    PALETTEENTRY palPalEntry[1] ;
}
LOGPALETTE ;
```

The first field is set to `0x300` (indicating *Windows* 3.0 compatibility) and the second field is set to the number of entries in the palette table. We want 65 gray shades, so we set this field to 65.

The third field in the `LOGPALETTE` is an array of `PALETTEENTRY` structures, one for each of the palette entries.

Figure 2: Here the GRAYS program is running on an 8514/A using dithering to render 65 gray shades.

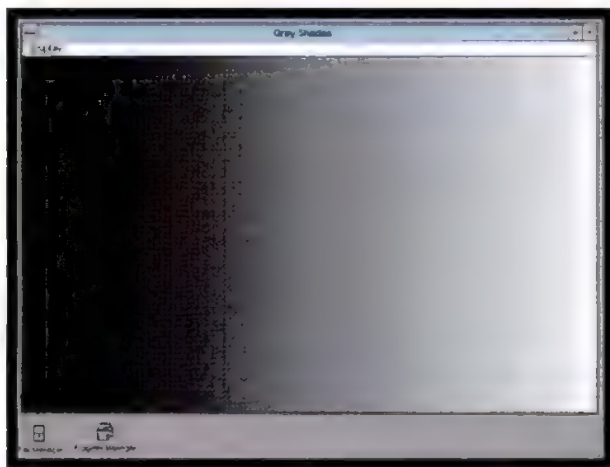
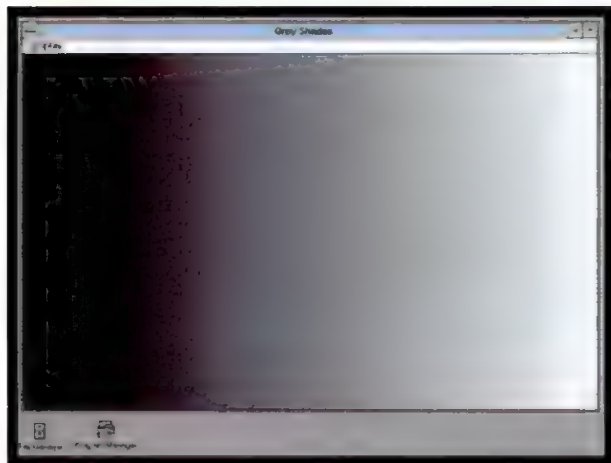


Figure 3: Here the GRAYS program is running on an 8514/A, using the palette manager to render 65 pure gray shades.



Environments

The PALETTEENTRY structure is defined like this:

```
typedef struct
{
    BYTE peRed ;
    *BYTE peGreen ;
    BYTE peBlue ;
    BYTE peFlags ;
}
PALETTEENTRY ;
```

Each of the 65 PALETTEENTRY structures defines an RGB color value that we want in the new palette.

But notice that LOGPALETTE is defined for an array of only one PALETTEENTRY structure. We need a LOGPALETTE structure large enough for 65 PALETTEENTRY structures. The solution is to use the Windows LocalAlloc function to allocate some local memory large enough for one LOGPALETTE structure and 64 additional PALETTEENTRY structures. The LocalLock function returns a pointer to this block of memory.

At this point GRAYS loops from 0

through 64, calculates a gray level (which is the loop index times 4, maximized at 255), and sets the peRed, peGreen, peBlue fields of the structure to this gray level. The peFlags field is set to 0.

WndProc passes the pointer to this block of memory to CreatePalette, saves the palette handle in a static variable, and then frees the memory.

A logical palette is a GDI object. Like logical pens and logical brushes, logical palettes are not automatically freed when a program terminates. WndProc takes care of deleting the logical palette during the WM_DESTROY message by calling DeleteObject.

Note that the logical palette is independent of a device context. Before you can actually make use of it, it must be selected into a device context and "realized," as I'll demonstrate shortly.

THE GRAYS MENU SELECTIONS

The GRAYS program has one item on its top-level menu—Display. This item invokes a submenu with three mutually exclusive options: Dithered, Palette (RGB Selection), and Palette (INDEX Selection). These options correspond to three

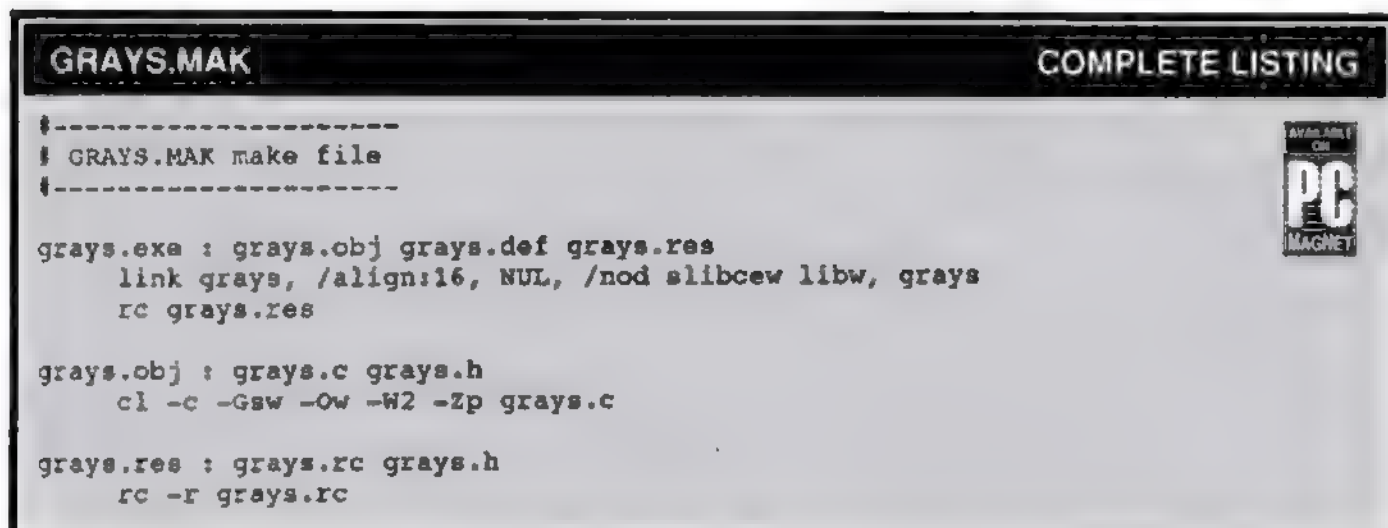


Figure 4: The GRAYS.MAK file automates construction of the GRAYS.EXE executable.

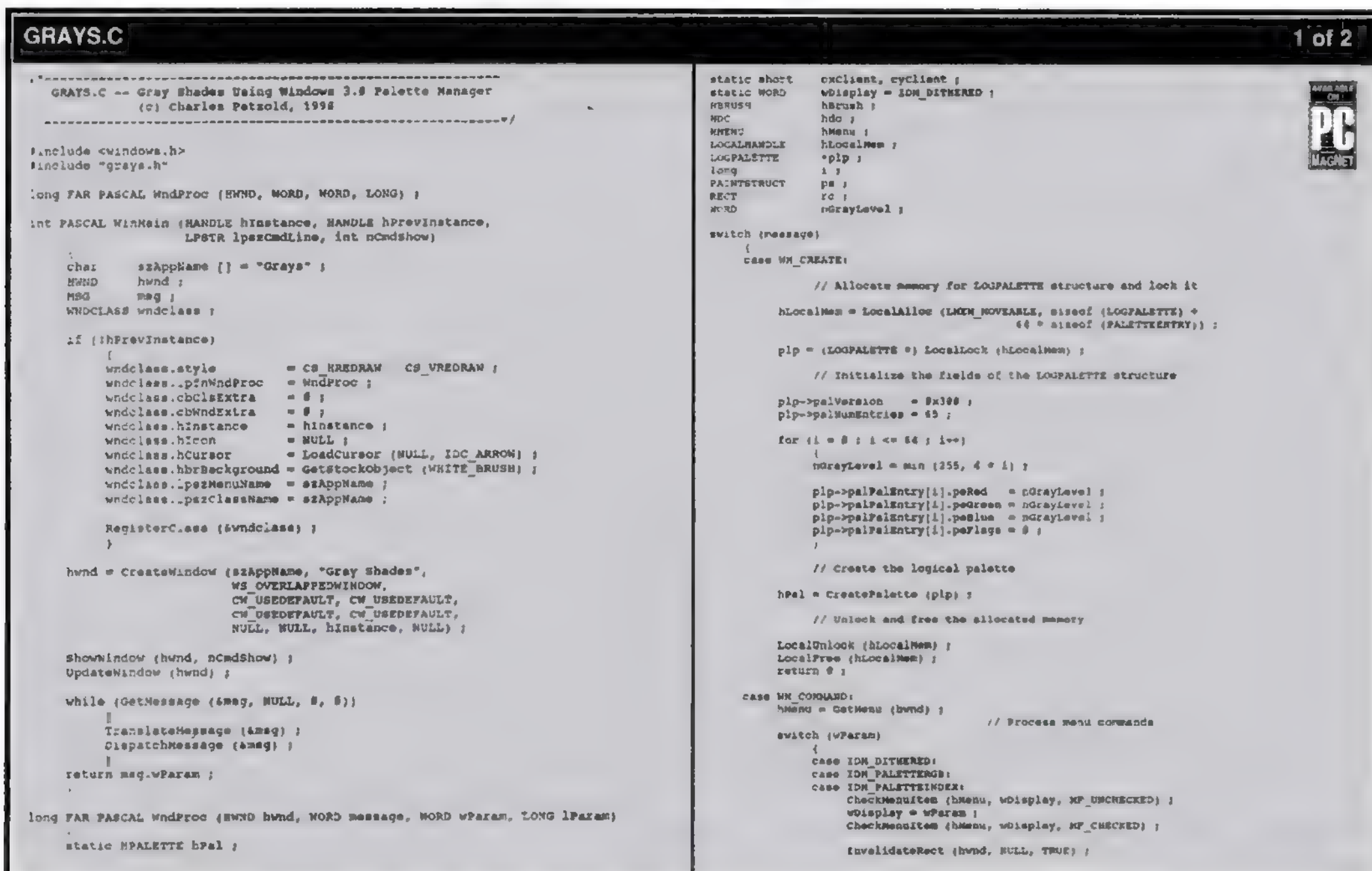


Figure 5: This is the source code for the GRAYS.EXE program.

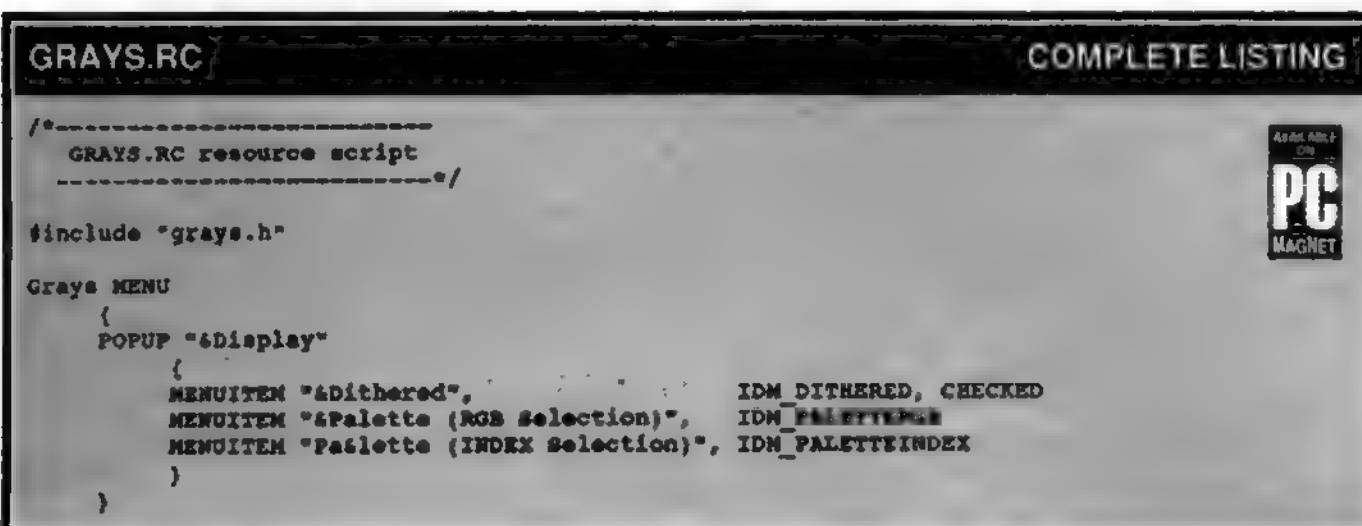


Figure 6: The GRAYS.RC resource script file contains the definition of the program's menu.

identifiers defined in the GRAYS.H file: **IDM_DITHERED**, **IDM_PALETTEGB**, and **IDM_PALETTEINDEX**.

The default is Dithered, which means that GRAYS doesn't use the palette manager at all. The two other choices use the palette manager but select color in two different ways. **WndProc** puts (and removes) check marks on these three menu items during the **WM_COMMAND** message and stores the current menu choice in the **wDisplay** variable.

If you follow through the **WM_PAINT**

logic when **wDisplay** is **IDM_DITHERED**, you'll see that the program doesn't use the palette handle and hence displays dithered gray shades as usual. For each of the 65 rectangles displayed in the client area, the program defines the coordinates of a **RECT** structure, creates a brush using the **RGB** macro and **CreateSolidBrush**, and then fills the rectangle with **FillRect**.

SELECTING AND REALIZING

The other two menu options cause the GRAYS program to use the logical pal-

ette we've created. Two functions are required:

- The **SelectPalette** function selects the logical palette into the device context. Only one logical palette can be selected into the device context at any time. The function returns the logical palette previously selected in the device context.

- The **RealizePalette** function causes *Windows* to "realize" the logical palette in the device context by mapping the colors to the system palette and to the physical palette of the video board. The real work goes on during this function call. *Windows* must determine whether the window calling the function is active or inactive and perhaps notify other windows that the system palette is changing. (We'll see how this notification works shortly.)

The other change when GRAYS uses the palette manager involves the way that the program specifies color.

SPECIFYING COLOR

As we've seen in previous columns, you specify a color in *Windows* using a

IT'S OUR WORD AGAINST THEIRS.

WordStar 6.0 vs. WordPerfect 5.1



With our Advanced Page Preview,[™] including true font preview, what you see is what you get.

WordStar 6.0 vs. WordPerfect 5.1

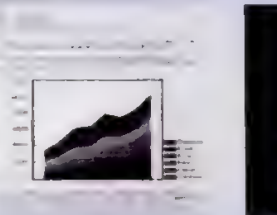
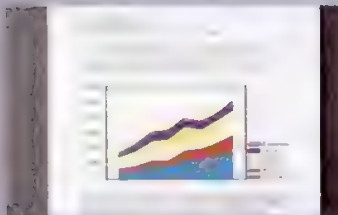


WordStar comes with a Graphics Editor.



WordPerfect doesn't (it's an additional \$495).

WordStar 6.0 vs. WordPerfect 5.1



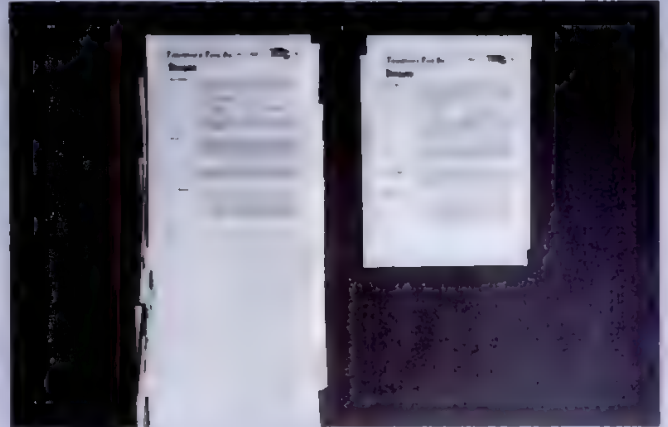
We print color graphics, they don't.

WordStar 6.0 vs. WordPerfect 5.1



WordStar includes Telecommunications. WordPerfect doesn't.

WordStar 6.0 vs. WordPerfect 5.1



Page preview: 144 pages* vs. 2 pages.

DON'T JUST TAKE OUR WORD. TAKE OUR FREE \$140 MONT BLANC PEN.

For a limited time only, you can get a free Mont Blanc pen with the purchase of any new WordStar 6.0 software.

In effect, you'll be getting two great word processors for the price of one.

Mont Blanc, the world's finest writing instrument. And WordStar 6.0, the newest and most advanced word processing software on the market.

See your participating computer software dealer now through February 28, 1991. For the dealer nearest you, call 800-227-5609.

Then send in this coupon along with your name, address, sales receipt and product registration card to the address below.

A free Mont Blanc pen. And all you have to do is take our word for it.



Free Mont Blanc pen available only with the purchase of WordStar 6.0 retail single user product or LAN Starter product purchased between November 15, 1990 and February 28, 1991. Offer good in U.S. and Canada only. Send this coupon along with name, address, original sales receipt and product registration card to Pen Offer, P.O. Box 6113, Novato, CA 94948. Allow 5-6 weeks for delivery of pen. WordStar is a registered trademark and Advanced Page Preview is a trademark of WordStar International Incorporated. © 1991 WordStar International Incorporated. *Monitor dependent. **Third party trademark. Canadian duties and taxes not included.

CIRCLE 255 ON READER SERVICE CARD

Environments

COLORREF (color reference) value. Variables for **COLORREF** values usually begin with a **cr** prefix. Normally, a **COLORREF** value is an RGB (red-green-blue) color value—a 32-bit long integer where the upper byte is 0 and the lower 3 bytes are the intensities of red, green, and blue:

```

+-----+-----+-----+
|00000000| Blue | Green | Red |
+-----+-----+-----+

```

You can create an RGB color value using the **RGB** macro defined in **WINDOWS.H**:

```
cr = RGB (r,g,b) ;
```

where **r**, **g**, and **b** are the intensities of red, green, and blue, ranging from values of 0 through 255.

A program that uses the *Windows* palette manager can continue to use RGB color values to specify color. However, these RGB color values will not give access to the additional colors in the logical palette. They'll have the same effect as if the palette manager were not being used.

To make use of the additional colors in the logical palette, you have a choice between two methods. A *Palette RGB* color is very much like an RGB color

except that the high byte is set to 2 rather than 0:

```

+-----+-----+-----+
|00000002| Blue | Green | Red |
+-----+-----+-----+

```

You can create a Palette RGB value using the **PALETTERGB** macro defined in **WINDOWS.H**:

```
cr = PALETTERGB (r,g,b) ;
```

A *Palette Index* color is different. The high byte is 1 and the value in the low 3 bytes is an index into the palette table:

```

+-----+-----+-----+
|00000001|          Index          |
+-----+-----+-----+

```

You can create a Palette RGB value using the **PALETTEINDEX** macro defined in **WINDOWS.H**:

```
cr = PALETTEINDEX (i) ;
```

where **i** represents the index. In the **GRAYS** program, the logical palette contains a total of 65 entries. The indexes for these entries are 0 through 64. The value

PALETTEINDEX (0)

refers to black; the value

PALETTEINDEX (32)

refers to medium gray; and

PALETTEINDEX (64)

refers to white.

After you've selected a logical palette into your device context, you can use **COLORREF** values created from the **PALETTEINDEX** or **PALETTEINDEX** macros to specify color in the same way you use the **RGB** macro to specify color. **GRAYS** demonstrates both methods. It uses the **PALETTEINDEX** or **PALETTEINDEX** macros to pass a color to **CreateSolidBrush**, depending on whether the second or third option on the menu has been selected.

Here are the important rules:

- To use a color in your logical palette, specify it using a Palette RGB value or a Palette Index value. Don't use a normal RGB value. If you do, you'll get one of the standard colors — not a color from your logical palette.
- Don't use Palette RGB values or Palette Index values when you haven't selected a palette in your device context.
- Although you can use a Palette RGB value to specify a color not in the logical palette, the color you get will be selected from the logical palette or one of the standard colors. You'll probably want to use RGB color values to select colors that aren't in the palette.

You should note that **GRAYS** never checks to see whether the video driver actually supports palette management. The palette manager functions work regardless, but on devices such as the VGA, the device driver continues to use dithered colors.

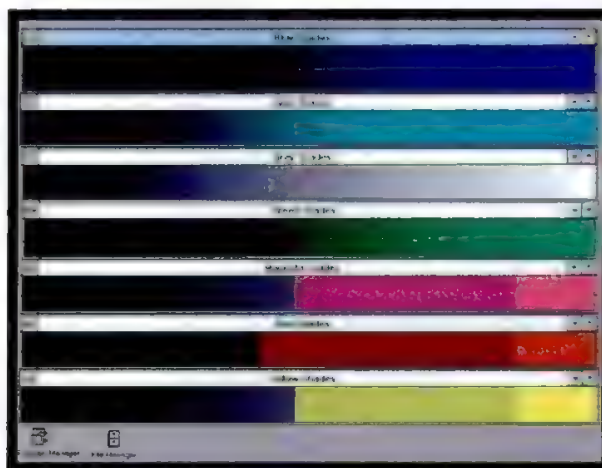


Figure 9: Seven programs requiring 65 different colors each, running on the 8514/A.

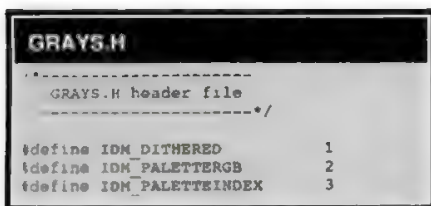


Figure 7: The **GRAYS.H** header file defines constants used both by **GRAYS.C** and **GRAYS.RC**.

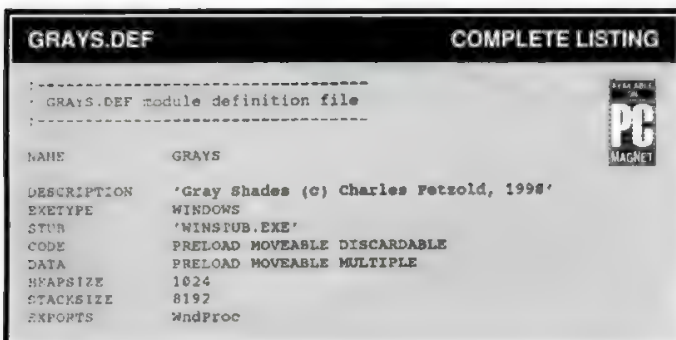


Figure 8: **GRAYS.DEF** is the module-definition file for the program.

Environments

THE WM_QUERYNEWPALETTE MESSAGE

As I mentioned, if multiple *Windows* programs are using the palette manager, the active window gets priority over the palette. The most recently active window gets second priority, and so forth. Whenever a new program becomes active, the *Windows* palette manager usually must reorganize the system palette table. To help in this, the *Windows* palette manager includes two new messages sent to main windows. The first one is WM_QUERYNEWPALETTE. This message is sent to a main window when it is about to become active. If you use the palette manager when drawing on your window, you must process this message. GRAYS demonstrates how to do this. It obtains a device-context handle, selects the palette into it, and then checks the return value of RealizePalette. If RealizePalette returns nonzero (which indicates that the system palette required some rearrangement), then GRAYS invalidates the window to generate a WM_PAINT message and returns TRUE. Otherwise, it returns FALSE.

THE WM_PALETTECHANGED MESSAGE

Whenever the system palette changes, *Windows* sends the WM_PALETTECHANGED message to all main windows, starting with the most active window and proceeding down the window chain. The wParam value passed to the window procedure is the handle of the active window. A program using the palette manager should process this message only if wParam is not equal to the program's window handle.

If you don't care about how the client area looks when your program is inactive, you don't need to process this message. Otherwise you have two choices. GRAYS shows one of them: As when processing the WM_QUERYNEWPALETTE message, it gets a device context, selects the palette into it, and then checks the return value from RealizePalette. If the return value is greater than 0, GRAYS invalidates the window.

There is an alternative that makes more sense when your window requires a long time to repaint—that is to call the UpdateColors function rather than calling

InvalidateRect, as GRAYS does. UpdateColors changes the values of pixels in your window to help preserve the previous colors.

TESTING IT OUT

To determine whether I got the processing for these two messages right, I made seven variations of the GRAYS program, each of which requires 65 colors. I ran these seven programs together, and the

result is shown in Figure 9.

The program at the top is active, the second program was previously active, and the program at the bottom was active least recently. As you can see, the top three programs each have the full range of colors they request. The fourth program loses a few colors towards the right end of the fountain. The rest of the programs essentially get what's left over—the standard colors.

"I Get Paid To Write Programs. And Now I'm Writing Them Twice As Fast."

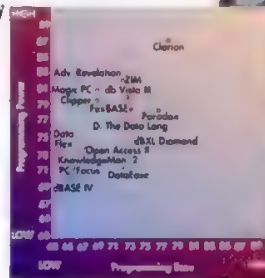
If you write programs for a living, get to know The Clarion Professional Developer® 2.1.

It can cut applications development time by 50% or more without compromising your design. It's so fast and easy, you can complete prototypes while your clients watch.

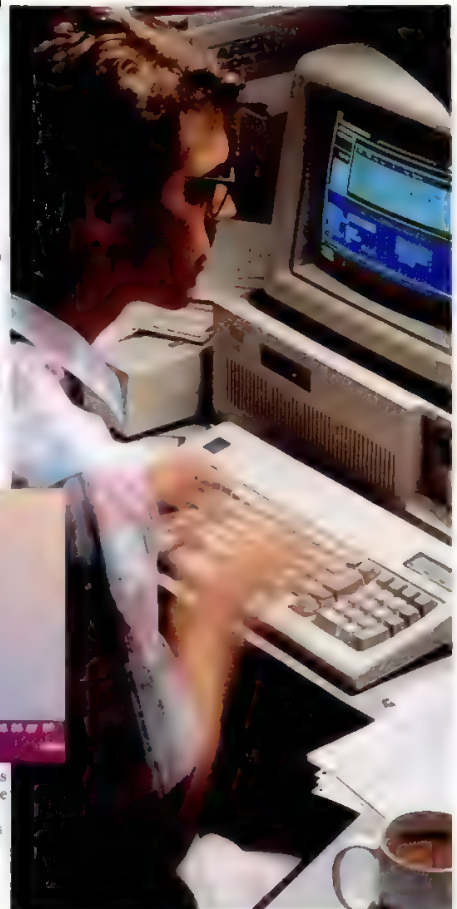
Professional Developer 2.1 is an immensely powerful, easy-to-use DBMS/programming environment which interfaces to routines from C and Assembler. It allows import and export of dBASE, BASIC and DIF files. Its application generator produces commented source code which can be easily adapted with its utilities to allow you to generate .EXEs. Network support is included at no extra cost. There are no run-time licenses or fees. And now Version 2.1 includes Report Writer, which allows you to easily and intuitively create ad hoc reports and queries (from Clarion files, non-Clarion files or any combination).

In this business where time is money, let Professional Developer help you generate more money for your time. Below is a partial list of our worldwide network of dealers. For the one nearest you, call:

(U.S.A.) 800-354-5444
(Canada) 305-785-4555



Here's what American corporations in a PC Week survey thought of the power and ease of use of Professional Developer vs. competitors



CLARION SOFTWARE™

150 East Sample Road
Pompano Beach, FL 33064

AZ, Tucson
Computer
Warehouse
(802) 747-3550

CA, Garden Grove
Computer City
Supercity
(714) 892-0070

IL, Lombard
Icom
(708) 932-8000

OK, Midwest City
Software City
(405) 732-8767

TX, Arlington
Soft Warehouse
Inc.
(817) 461-5503

CA, Westminster
Pro-Com
(714) 847-8455

FL, Jacksonville
Crazy Bobs
Computer Warehouse
(904) 733-1338

MI, Madison Heights
Soft Warehouse Inc.
(313) 585-7600

QC, St. Laurent
Chemtek
International
(514) 333-0858

WI, Sheboygan
Base 2 Corp
(414) 457-6283

Clarion Software Products run on any IBM PC, PS/2, or true compatible with 512K of memory and a hard disk. Clarion Professional Developer is a registered trademark and Clarion Software is a trademark of Clarion Software. Copyright 1989 Clarion Software. dBASE is a registered trademark of Ashton Tase.

CIRCLE 178 ON READER SERVICE CARD

What makes our Tempo so catchy.

\$1199



Tempo 286/12c

- 80286 12MHz CPU
- Standard 1MB RAM (Expandable to 8MB)
- 1.44MB 3.5" Diskette Drive
- Zero Wait-State Operation
- Slimline Compact Footprint
- 80287 Math Coprocessor Socket
- DOS 4.01 Included

\$1240



Tempo 286/12

- 80286 12MHz CPU
- Standard 1MB RAM (Expandable to 4MB)
- 1.2MB 5.25" Diskette Drive
- Zero Wait-State Operation
- Small or Large Footprint
- 80287 Math Coprocessor Socket
- DOS 4.01 Included

\$1299



Tempo 286/16

- 80286 16MHz CPU
- Standard 1MB RAM (Expandable to 4MB)
- 1.2MB 5.25" Diskette Drive
- Zero Wait-State Operation
- Small or Large Footprint
- 80287 Math Coprocessor Socket
- DOS 4.01 Included
- Novell® Certified

In a word, value.

Tempo™ is a new family of low cost IBM®-compatible PCs from one of the most respected companies in the computer industry. Everex™

Don't let the low price fool you. For sheer computing performance, in an office or

on the road—Tempo never lets up. They're everything you or your company will need for optimum PC performance.

Additional Tempo features include an enhanced keyboard. One parallel and two serial ports.* Eight expansion slots for the large and small footprint models, four for the

slimline compact footprint, and one proprie-



\$1475



Tempo 386SX/16

- Intel® 80386SX 16MHz CPU
- Standard 1MB RAM (Expandable to 8MB)
- 1.2MB 5.25" Diskette Drive
- Zero Wait-State Operation
- Small or Large Footprint
- 80387SX Math Coprocessor Socket
- DOS 4.01 Included
- Novell Certified

\$1999



Tempo 386/20

- Intel® 80386 20MHz CPU
- Standard 1MB RAM (Expandable to 16MB)
- 64KB Static RAM Cache
- 1.2MB 5.25" Diskette Drive
- Effective Zero Wait-State Operation
- Socket for Intel 80387 or Weitek® 3867 Math Coprocessor
- DOS 4.01 Included
- Novell Certified

\$2199



Tempo 386/25

- Intel® 80386 25MHz CPU
- Standard 1MB RAM (Expandable to 16MB)
- 64KB Static RAM Cache
- 1.2MB 5.25" Diskette Drive
- Zero Wait-State Operation
- Socket for Intel 80387 or Weitek® 3867 Math Coprocessor
- DOS 4.01 Included
- Novell Certified

\$2999



Tempo LX

- Intel® 80386SX 16MHz CPU
- VGA Backlit Display
- 2-3 Hour Battery Life
- Power Conservation Mode
- 1-Hour Quick Charge
- Full Travel, 82-Key Keyboard
- 1MB RAM (Expandable to 5MB)
- 20MB Internal Hard Drive
- 1.44MB 3.5" Internal Diskette Drive
- 80387SX Math Coprocessor Socket
- DOS 4.01 Included
- 6.9 lbs. (Including Battery)

tary for the Tempo LX. 1:1 interleave hard disk controllers. And, they're supported by a full array of Everex peripherals.

What's more, every Tempo PC is compatible with the high-performance Everex STEP™ line of computers. In fact, the same high standards in quality engineering that go

into every STEP computer product, also go into every Tempo product.

Every Tempo computer is backed by a full one-year parts warranty and a three-month on-site service warranty.

Catch the Tempo family at a reseller near you. To find out where, call 1-800-437-

EVER. Outside the U.S., call 415-498-1111 or FAX us at 415-651-0728.

But hurry. Because at these prices, the Tempo is going to move fast.



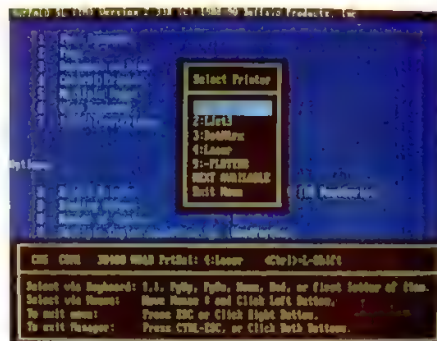
CIRCLE 113 ON READER SERVICE CARD

Printer Sharing Solutions

5 or 10 Ports



- * **Reliable Automatic Switching**
- * **Easy to Install and Use**
- * **No PC RAM Memory Required**
- * **Toll-Free Technical Support**
- * **45-Day Money-Back Guarantee**



HWP *5 Ports*

HWP-256	with 256KB	\$325
HWP-512	with 512KB	\$375
HWP-1000	with 1MB	\$425

User Upgradable Memory:
From 256KB to 16MB buffer

Input/Output Settings – 4/1 or 3/2:
All parallel ports; user configurable as either three inputs to two outputs, or four inputs to one output, buffered auto-switch

Rapid Data Transfer – 100,000 cps:
The HWP uses Direct Memory Access (DMA) for data transfers into the buffer, making the HWP hardware capable of receiving parallel data at the high rate of 100,000 characters per second.

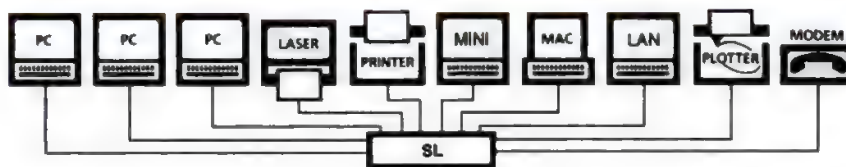
Pop-up Menu or Front Panel Buttons:
Use either the pop-up menu or the front panel switches to select printers, select the next available printer, send multiple copies, clear data, and other functions.

AS-41 *5 Ports* *\$200*

Smart Switch – No Pop-up or Buffer:
Four parallel inputs to one parallel output, electronic automatic switch with no buffer

SPPS (not shown) *\$100*

Interface Converter – No Buffer
Combination serial-to-parallel, or parallel-to-serial interface converter in a single unit; low-power CMOS design derives power from serial connection, no power supply needed; supports 9,600 to 115,200 bps, DIP switch configurable



Save Money by Sharing Office Resources:

The SL is the peripheral sharing solution which enables everyone to share lasers, printers, plotters, and modems. The HWP is ideally suited for sending large graphics files, but is economical enough for any kind of printing within a small workgroup.

Greater access by more users reduces unproductive idle time and the expense of purchasing additional peripherals. With a buffer, all users can simultaneously send print data and quickly release their PCs to continue working.

BUFFALO

We are the world's largest manufacturer of buffered data switches for PCs which assures your getting the best value and highest performance from our products.

Call For More Information
(800) 345-2356

Fax (503) 585-4505

Buffalo Products, Inc.
2805 19th St. SE, Salem, OR 97302-1520

SL or SLP *10 Ports*

SL or SLP-256	with 256KB	\$495
SL or SLP-512	with 512KB	\$575
SL or SLP-1000	with 1MB	\$675

Two Configurations – Ten Ports Each:

SL – four parallel and six serial ports

SLP – eight parallel and two serial ports

Both include 15 ft. serial null-modem cable

User Upgradable Memory:
From 256KB to 4MB buffer

Any Combination of Printers or PCs:
All ten SL or SLP ports can be software configured as either input or output.

Automatically Routes and Buffers Data:
Automatic switching and queuing of jobs; automatically converts data from parallel-to-serial or serial-to-parallel

115,200 bps PC-to-PC File Transfers:
Transfer files serially between PCs up to 115,200 bps; buffer serial data to the SL several times faster than normal 9,600 bps

Pop-up Menu via Hotkeys or Mouse:
Keyboard selection of printers and many other control functions; pop-up is for convenience, but is not required

Simple Installation:
Plug in your cables; if desired, run the installation software for the pop-up menu

CIRCLE 328 ON READER SERVICE CARD

by
Ray Duncan

Power Programming

DOS Extenders Old and New: Protected-Mode Programming in DOS

The agonizingly slow acceptance of OS/2, the invention of DOS extenders, the release of *Windows* 3.0, and the industry standardization of the DOS Protected Mode Interface (DPMI) all have given MS-DOS a new lease on life. While no one denies that desktop PCs will eventually migrate to a true protected-mode operating system, it's no longer so clear just what that system will be or how soon it will arrive. Although I have personally invested a lot of time and effort in OS/2 and admire its design and implementation, I've become very skeptical about its chances of replacing DOS on a large scale. It now seems much more likely that MS-DOS will simply be succeeded by itself in the form of a high-tech, 32-bit, 386-specific MS-DOS kernel running *Windows*.

In any event, DOS extender technology is the name of the game for the foreseeable future. I predict that as competition in the DOS market grows increasingly fierce, the programs become more and more complex, and users' expectations grow greater and greater, nearly every software developer will find himself or herself reaching for a DOS extender to improve performance and relieve memory limitations. I also predict that the use of expanded memory (LIM EMS) in new applications will rapidly fade away; most implementations of DPMI on 386 or later CPUs will support true virtual memory, so that EMS and the convoluted programming it requires will soon be perceived as irrelevant and not worth the effort.

Until now, DOS extenders have been relatively expensive programming environments with primitive debugging support, and they haven't been readily available to the casual programmer. This will soon change drastically, because *Windows* 3.0 has a built-in DOS extender, and all *Windows* programs that run in protected mode use it automatically. As I demonstrated in the last column, non-*Windows* applications can also take advantage of the *Windows* 3.0 DOS extender, once they've called the DPMI interface directly to switch

■ It now seems likely that MS-DOS will simply be succeeded by itself in the form of a high-tech, 32-bit, 386-specific MS-DOS kernel running *Windows*, and DOS extender technology will be the name of the game for the foreseeable future.

the CPU into protected mode. In other words, many of the benefits of protected-mode programming are now potentially available to anyone who has access to a DOS-based compiler and linker and can afford \$50 for the *Windows* 3.0 update.

I think it's a good idea to review how traditional DOS extenders work before taking a closer look at the *Windows* 3.0 DOS extender.

HOW TRADITIONAL DOS EXTENDERS WORK

When you buy a pre-*Windows* 3.0 DOS-based application that runs in protected mode, such as *Mathematica*, *Paradox* 386, or *Interleaf Publisher*, you're actually buying two programs: the DOS extender, which is usually licensed from a third party such as Phar Lap or Rational Systems, and the application itself. The application developer purchases a distribution license from the DOS extender developer so he can ship one executable file, with the application and DOS exten-

der "bound" together (see Figure 1).

From the MS-DOS loader's point of view, the DOS extender is the only thing in the executable file, because it's the only part of the file that's described by the .EXE file header. MS-DOS loads the DOS extender into conventional memory in real mode, performs any necessary relocations, and passes control to the DOS extender in the normal manner. The DOS extender then allocates additional memory (conventional, extended, or both), opens its own executable file, and reads the actual application into memory, performing any fixes that might be required. MS-DOS cannot load the protected-mode application directly, because the MS-DOS loader knows absolutely nothing about protected-mode selectors and even less about the 32-bit fixes that are found in 80386 object code.

Next, the DOS extender sets up a protected-mode environment for use by the application. It builds the interrupt descriptor table, local and global descriptor tables, page tables, and task-state segment that will provide addressability once the CPU is in protected mode. This step usually includes the creation of special selectors that map the video refresh buffer, the application's program segment prefix, the BIOS data area, and other structures that the application program may wish to manipulate directly. Finally, the DOS extender switches the CPU into protected mode and passes control to the application's entry point (Figure 2).

Once the application is running, the DOS extender carries out its vital role as an interface between the protected-mode

Power Programming

application and real-mode DOS via its complete control of the interrupt system. In fact, the DOS extender can be thought of as a terminate-and-stay-resident (TSR) interrupt handler that—from MS-DOS's point of view—happens to live in memory owned by the application, and therefore vanishes along with the application when the application terminates. The DOS extender must field every interrupt that occurs in protected mode, whether it is caused by an external event (such as the real-time clock), an internal exception (such as division by zero), or a software interrupt executed by the application.

In most cases, when an interrupt occurs in protected mode, the DOS extender simply switches the CPU into real mode and "reflects" the interrupt to the original real-mode handler, but some interrupts receive special handling. For example, the DOS extender usually reprograms the 8259 interrupt controller to reassign external hardware interrupts 08h through 0Fh to new interrupt numbers, so that these interrupts can be differentiated from the internal interrupts caused by General Protection Faults, Stack Faults, and

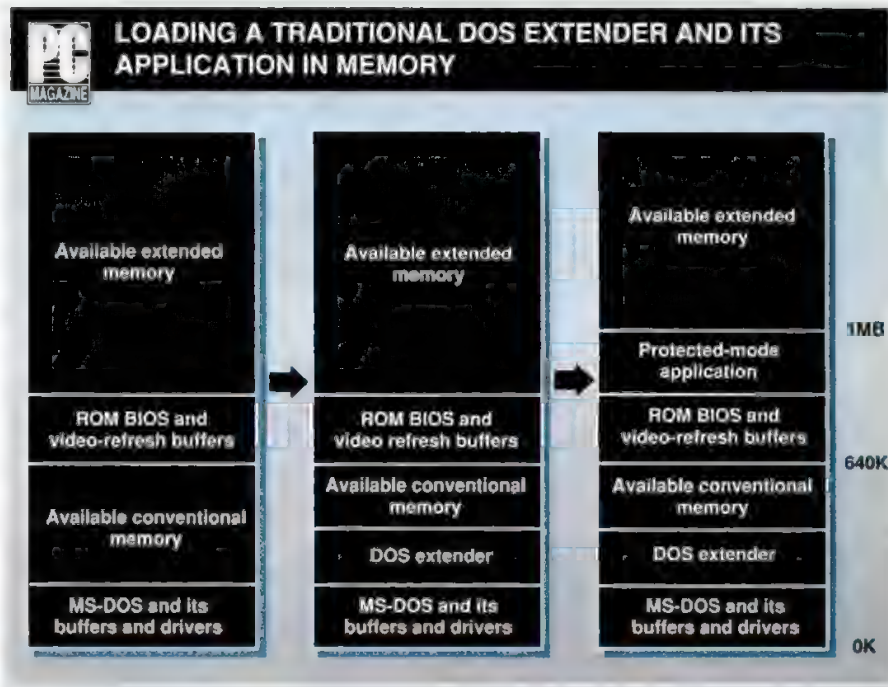


Figure 2: The MS-DOS system loader loads and relocates the DOS Extender in conventional memory. The DOS extender then allocates extended memory to hold the application, opens its own executable file, reads the application from disk, and performs any necessary fixes or relocations.

so on. The application can also register its own protected-mode handlers for internal or external interrupts, if it wishes, by calling special DOS extender functions. The most important special processing, however, occurs on the interrupts used for function requests by the application: MS-DOS INT 21h, ROM BIOS video driver INT 10h, and so on.

The DOS extender's actions, once it has intercepted such a function call, depend on the type of function being requested. There are four basic classes of functions that the DOS extender must be concerned with (Figure 3):

- Functions that require little more than a mode switch
- Functions that address application buffers and therefore require data movement and address translation
- Functions that must be completely replaced to make them meaningful in protected mode
- Function calls that are unique to the DOS extender itself and provide special services that have no equivalents in MS-DOS or the ROM BIOS.

In the first class of functions, all parameters are passed in registers, and the parameters don't include any addresses. The MS-DOS character I/O functions for the console, serial port, and printer are

good examples. Handling of these function calls is straightforward. After it has intercepted the software interrupt, the DOS extender saves the protected-mode context, switches the CPU into real mode, and reissues the interrupt—passing control to MS-DOS or the ROM BIOS. When the function call is completed, the DOS extender switches the CPU back into protected mode, restores the full protected-mode context (such as the high 16-bits of the 80386's registers, which are not necessarily preserved by MS-DOS or its device drivers), and returns control to the application.

The next, slightly more complex class is composed of functions whose parameters include the address of a buffer or other data structure. In their original form, these addresses are meaningless to MS-DOS or the ROM BIOS for two reasons: the address is in the form of a selector and offset rather than a segment and offset, and the buffer or data almost always lies above the 1MB boundary. The DOS extender handles this problem by using its own private buffers below the 640K boundary as intermediary storage. For example, in the case of a file write request, the DOS extender intercepts the write request, copies the data from the application's buffers in extended memory to another buffer in

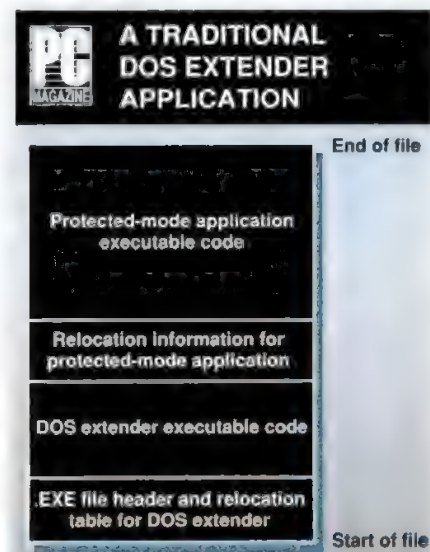


Figure 1: An example of a traditional DOS extender application. The DOS extender and the protected-mode application are bound together in a single executable file. The DOS extender is the only part of the file that is visible to the MS-DOS loader, because it is the only part described by the .EXE file header.

Power Programming

conventional memory, substitutes the conventional-memory buffer address for the original buffer address, switches the CPU into real mode, and finally issues the write function call to MS-DOS.

The third class of functions, where the DOS extender must replace MS-DOS or ROM BIOS services with new ones appropriate to protected mode, related mainly to memory management. For instance, the MS-DOS INT 21h Functions 48H (allocate memory block), 49h (release memory block), and 4Ah (resize memory block) are superseded by DOS extender functions that allocate, release, or resize blocks of extended memory. The DOS extender functions deal in protected-mode selectors rather than the paragraph or segment addresses used by MS-DOS, but this substitution is pretty much invisible to a "well-behaved" application, except for the much larger amounts of memory

that become available in protected mode.

The final class of functions—services that are made available uniquely by the DOS extender—cover a broad spectrum. For example, there are function calls to translate between real-mode and protected-mode addresses, alter various fields of descriptors, manipulate the interrupt descriptor table, allow a direct call on a real-mode subroutine from a protected-mode application, allocate chunks of conventional memory, and so on. Most of these function calls are for highly specialized or demanding situations and are not used in typical application programs.

As you can imagine, the authors of the first DOS extenders had to be eclectic programming virtuosos of the highest order, because they were really writing little protected-mode operating systems that had to survive in an eminently hostile environment. Not only did these developers have to know the MS-DOS and ROM BIOS interfaces (documented or otherwise) inside and out, and be familiar with

all the nasty little tricks of ill-behaved but indispensable applications such as *Lotus 1-2-3* or *SideKick*, they had to be complete masters of the various PC-compatible hardware architectures, of the special chip features of the 80286 and 80386, and even of the peculiarities of the various 80286 and 80386 accelerator boards.

As DPMI servers other than *Windows 3.0* become widely available, DOS extenders will be relatively easy to implement, because all of the hardware-dependent chores such as interrupt management, mode-switching, and descriptor and page-table maintenance become the responsibility of the DPMI server. I expect that, over the next few years, we'll see DPMI-based DOS extender functionality incorporated into the runtime libraries of all the popular high-level languages, so that any program you compile will automatically run in protected mode and use extended memory if a DPMI server is present. But in the interim, the task of the DOS extender author is more arcane than ever. Not only must a commercially viable DOS extender be able to run on a bare-bones DOS system, it must also be able to coexist peacefully in a system with an XMS driver, a VCPI server, or a DPMI server (Figure 4).

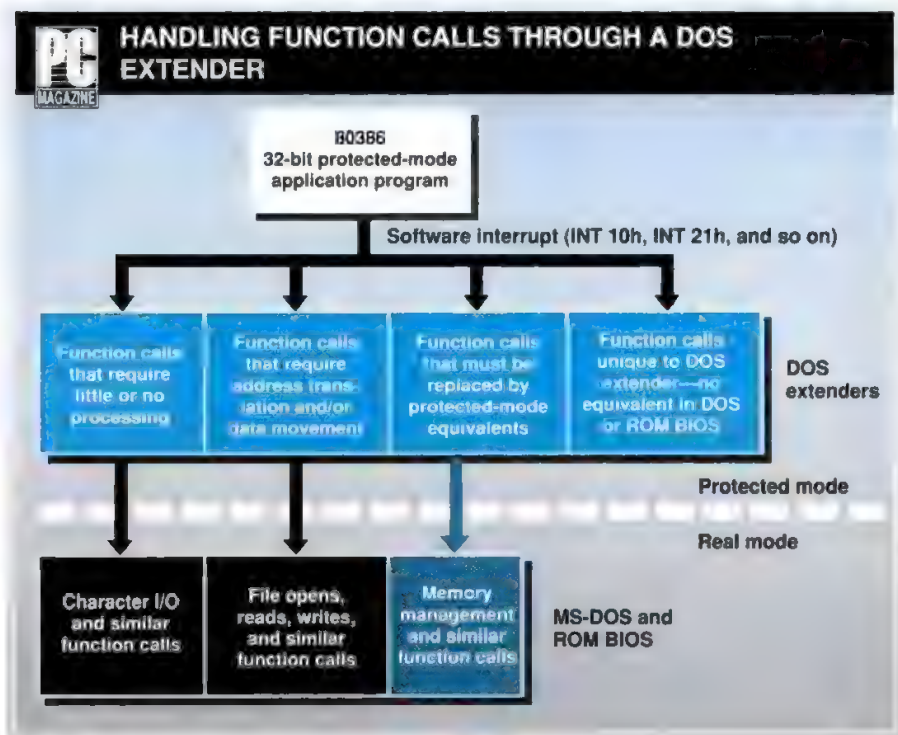


Figure 3: The function calls made by a protected-mode application fall into four different classes for handling by the DOS extender. Register-based functions can be passed straight through to DOS. Functions that have the address of a buffer or other data structure as one of the parameters require address translation and copying of the data through an intermediary buffer below the 1MB boundary. The MS-DOS memory management functions are replaced by DOS Extender functions that allocate, resize, and release blocks of extended memory. There is also a fourth group of functions that are unique to the particular DOS extender being used and have no equivalent in MS-DOS or the ROM BIOS.

THE WINDOWS 3.0 DOS EXTENDER

In *Windows 3.0*, a DOS extender is an integral part of the environment, rather than being embedded in individual application executable files like a traditional DOS extender. By using this approach—in effect, presenting programs with the same function call interface whether they are running in real mode or protected mode—Microsoft avoided many of the problems that have plagued OS/2 since its introduction. Programmers aren't confronted with a new API to learn, no new documentation has to be created, and runtime libraries don't need to be rewritten. The transition for software developers who have "followed the rules" in coding their *Windows* applications is essentially painless.

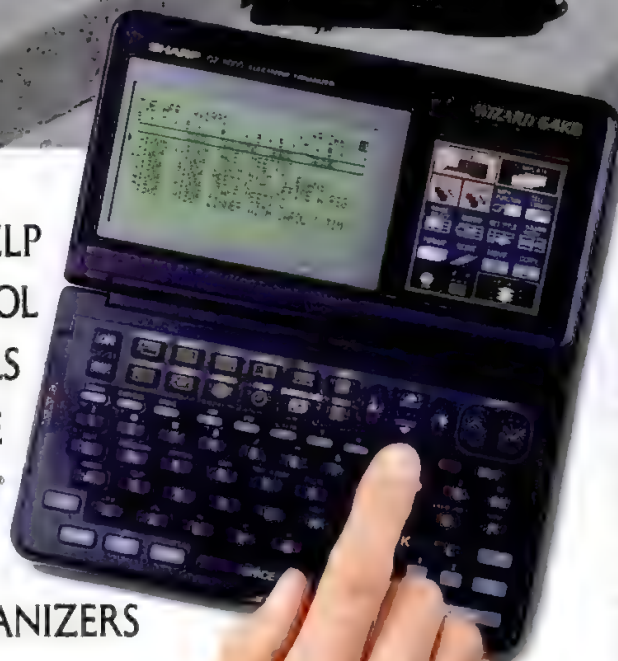
Windows 3.0's DOS extender is often confused with the fact that *Windows 3.0* is also a DPMI server—in fact, it is the only commercially available DPMI server as this is written. The confusion has a perfectly logical explanation. Microsoft's original internal specification defined the DPMI in two layers: a set of low-level functions for interrupt management, mode switching, and extended memory man-

WIZARD.



© 1990 Sharp Electronics Corporation

NOTHING CAN HELP
YOU TAKE CONTROL
OF ALL THE DETAILS
OF YOUR BUSY LIFE
LIKE THE WIZARD®
AND ZQ SERIES
ELECTRONIC ORGANIZERS
FROM SHARP.



INTRODUCING THE WIZARD® 8000.

The OZ-8000 is a powerful yet uncomplicated computer that fits in the palm of your hand. Our new "Help" key provides step-by-step instructions for each function. Eleven built-in features include a Text Outliner and Business Card File. A raised keyboard and 40 character, 8 line display make it easy to enter, sort, and retrieve information quickly. You can even back up your data in seconds on an optional memory card.

THE POWER TO ORGANIZE YOUR BUSINESS AND PERSONAL LIFE.

ZQ-2000
12 Character x 4
display.

ZQ-2200
12 Character x 4
line display.
Exchange data with
other Sharp organizers
via PC-link software
or phone lines.

PC-link
Exchange data with
other Sharp organizers
via PC-link software
or phone lines.

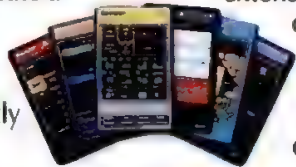
PC-link
Exchange data with
other Sharp organizers
via PC-link software
or phone lines.

PC-link
Exchange data with
other Sharp organizers
via PC-link software
or phone lines.

PC-link
Exchange data with
other Sharp organizers
via PC-link software
or phone lines.

MORE SOFTWARE. MORE FUNCTIONS.

All Wizard and ZQ series electronic organizers come with a complete array of built-in functions. With the OZ-7000 and 8000 series, you can also expand both applications and memory with Sharp's extensive library of optional software cards. Create a spreadsheet. Calculate loan payments. Track your expenses. Even send a fax directly from your Wizard.



And through Sharp's patented touch-screen technology, each card has its own custom keyboard for easy operation.



This symbol indicates software expandability.

THE PC CONNECTION.

The Wizard can be a portable extension of your home or office computer. With optional PC-link software and cable, you can swap files with any IBM® compatible or Macintosh® computer.

And an optional modem sends and receives data right over the phone lines.



This symbol indicates PC-link capability.

For a free brochure on Sharp's Wizard or ZQ series electronic organizers, or for the store nearest you, call 1-800-321-8877. In Canada call 1-416-890-2100.

SHARP.
FROM SHARP MINDS
COME SHARP PRODUCTS™
CIRCLE 193 ON READER SERVICE CARD

Power Programming

agement, and a higher-level interface (the DOS extender) that provided access to MS-DOS, ROM BIOS, and mouse-driver functionality via protected-mode execution of INT 21h, INT 10h, INT 33h, and so on. The higher-level functions were implemented in terms of the low-level functions and the underlying real-mode DOS and ROM BIOS services.

If the DPMI specification had become public in anything like its original form, the inevitable result would have been a de facto protected-mode version of MS-DOS. This didn't come to pass, however, because one of the trade-offs Microsoft had to make to get the existing DOS extender vendors to support DPMI was to excise its DOS extender-like capabilities. In other words, *Windows 3.0* still has its DOS extender, but those facilities are no longer part of the DPMI specification, so the programmer cannot assume they will be present on DPMI servers other than *Windows 3.0*. The DPMI as we know it today is a sort of second-generation version of the previous industry standard, the Virtual Control Program Interface (VCPI), and its functions are not intended to serve directly as a platform for an application.

At present, the *Windows 3.0* DOS extender is in a never-never land of semisupport and semidocumentation—like MS-DOS's TSR functions and network redirector interface. This is a bitter pill to swallow. I assume that the DOS extender documentation in the original Microsoft DPMI specification is still valid, since *Windows 3.0* was very close to its final form at the time that document was printed, but unfortunately that document was supplied under a nondisclosure agreement and the information in it hasn't appeared publicly elsewhere. The only public documentation of *Windows 3.0*'s DOS extender that I've stumbled on is a five-page leaflet that was given out at a recent *Windows* ISV seminar. This terse essay, entitled "Windows INT 21h and NetBIOS Support for DPMI," leaves a lot of interesting questions unanswered, but it does provide us with some critical information.

The first thing we learn from the document is that, although *Windows 3.0* in 386 enhanced mode supports the full range of DPMI 0.9 functions, in standard mode *Windows 3.0* supports only the subset of DPMI 0.9 functions that allow pro-

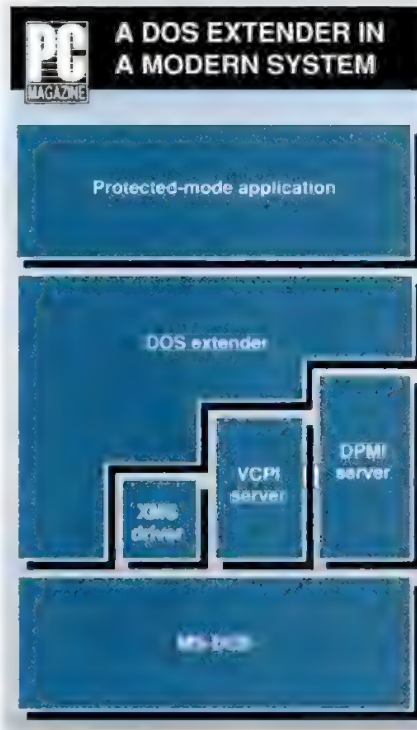


Figure 4: A modern DOS extender must be able to perform all protected-mode hardware control functions on its own, but must also be able to coexist peacefully with an XMS driver (such as HIMEM.SYS), a VCPI server (such as QEMM-386 or 386MAX), or a DPMI server (such as *Windows 3.0*). Since all three of these latter environments have drastically different programming interfaces and characteristics, the life of a DOS extender author is not an easy one!

ected-mode programs to communicate with real-mode TSRs and device drivers:

DPMI Function Number	DPMI Function Name
0200h	Get Real Mode Interrupt Vector
0201h	Set Real Mode Interrupt Vector
0300h	Simulate Real Mode Interrupt
0302h	Call Real Mode Procedure with Far Return Frame
0303h	Call Real Mode Procedure with IRET Frame
0304h	Allocate Real Mode Call-Back Address
0305h	Free Real Mode Call-Back Address

The second important assertion in this

document is that the *Windows 3.0* DOS extender supports nearly the entire "official" MS-DOS application program interface in a transparent manner. The only calls listed as not being supported are

Int 20h	Get Real Mode Interrupt Vector
Int 25h	Absolute Disk Read
Int 26h	Absolute Disk Write
Int 27h	Terminate and Stay Resident

and the following obsolete INT 21h functions:

Int 21h Function	MS-DOS Function Name
00h	Terminate Process
0Fh	Open File with FCB
10h	Close File with FCB
14h	Sequential Read with FCB
15h	Sequential Write with FCB
16h	Create File with FCB
21h	Random Read with FCB
22h	Random Write with FCB
23h	Get File Size with FCB
24h	Set Relative FCB Record
27h	Block Read with FCB
28h	Block Write with FCB

A few MS-DOS functions are listed as "partially supported," but the restrictions aren't very important:

■ INT 21h, functions 25h and 35h (Get and Set Interrupt Vector) only change or return the address of the protected-mode owner of the interrupt; they don't affect the handler that receives interrupts in real mode.

■ Callers of INT 21h, functions 38h and 65h (Get Country Information) must be aware that the DWORD address for the case-mapping routine returned in the data structure is a real-mode address.

■ INT 21h, function 44h (IOCTL), subfunctions 2, 3, 4, and 5 restrict data sizes to less than 4K if the buffer is above the 1MB boundary, while the code page capabilities of IOCTL subfunction 0Ch are not supported at all.

What about ROM BIOS calls? The original Microsoft DPMI specification explicitly listed nearly every ROM BIOS call and whether it was supported or not supported. The five-page public document says only the following: "If a software interrupt API is completely register-based without any pointers, segment registers,

Power Programming

or stack parameters, that API should work under *Windows* in protected mode." Fortunately, nearly all of the commonly used Microsoft Mouse driver (INT 33h) and ROM BIOS video (INT 10h), communications (INT 14h), keyboard (INT 16h), printer (INT 17h), and time and date (INT 1Ah) functions fall under the register-based umbrella and can be expected to work properly.

If you work in a high-level language, protected-mode programming under *Windows* 3.0 is easy, once you've written and debugged a small routine to make the switch to protected mode by a call to the DPMI interface. If you're lucky, your compiler's runtime library won't indulge in any of the following practices that cause

Protected-mode programming under *Windows* 3.0 is easy, once you've written a routine that will switch you into that mode.

problems in protected mode:

- use of segment registers for scratch storage
- performing arithmetic on the contents of segment registers
- direct comparison of far pointers
- reading or writing outside the limits of an allocated memory object
- self-modifying code.

In the next installment, we'll continue our discussion of protected-mode programming in the *Windows* 3.0 and DPMI environments.

THE IN-BOX

Please send your questions, comments, and suggestions to me at any of the following e-mail addresses:

PC MagNet: 72241,52

MCI Mail: rduncan

BIX: rduncan

How to keep your hard disk from cracking up.

Your hard disk is all broken up over this *file fragmentation* problem. But Disk Optimizer Tools will help you get your act together.

Disk been slowing down? That's because DOS breaks your files up into chunks of data and stores them all over your hard disk.

So to retrieve a file, your disk has to look for all its parts, and then assemble them—which means you have to wait up to three times longer than necessary. And all this movement causes wear and tear that can lead to premature breakdown of your disk.

But Disk Optimizer "glues" your files back together. Hard disk speed improves up to 300%. And the disk itself is revitalized to prevent

crashing, adding years to the life of your disk.

This is just one of the many utilities you get with Disk Optimizer Tools. They're all designed to give you peace of mind. And give your PC extra performance and security.

Get your files together before your hard disk cracks up and you're in a *really* sticky situation. Disk Optimizer Tools is just \$69.95 at your dealer. Or call SoftLogic Solutions at 800-272-9900.



SOFTLOGIC SOLUTIONS

One Perimeter Road, Manchester, NH 03103
603-627-9900 • 800-272-9900

© 1991 SoftLogic Solutions, Inc.

CIRCLE 724 ON READER SERVICE CARD

PROTECT YOUR COPIES OF PC MAGAZINE

Make your collection of *PC Magazine* a handsome addition to your office or home—and protect and organize your copies for easy reference!

PC Magazine Binders and Cases are made of durable, luxury-look leatherette over quality binder board. Custom designed for *PC Magazine*, every order receives FREE transfer foil to mark dates and volume numbers.

FOR FAST SERVICE CALL TOLL-FREE 1-800-825-6690

MAGAZINE BINDERS

Hold your issues on individual snap-on rods. \$9.95 each; 3 for \$27.95; 6 for \$52.95.



OPEN BACK CASES

Store your copies for individual reference. \$7.95 each; 3 for \$21.95; 6 for \$39.95.



PC MAGAZINE

c/o Jesse Jones Industries
499 East Erie Avenue • Philadelphia, PA 19134

Please send ☐ Binders ☐ Cases Quantity _____

Payment enclosed \$_____. * Add \$1 per case/binder for postage & handling. (Outside USA, add \$2.50 per case/binder ordered, US currency only.)

Charge my:

☐ Amex ☐ Visa ☐ MC (Minimum order \$15.)

Card No. _____ Exp. Date _____

Mr./Mrs./Ms. _____
Please Print Full Name

Address _____
No P.O. Box Numbers Please

City _____

State _____ Zip _____

*PA residents add 6% sales tax.



ZEOS® 386SX-20!

Only \$1595.

COMPLETE WITH A FULL 64K SRAM CACHE!

That's right! Now you can own the incredible new ZEOS 386SX 20MHz system, complete with a full 64K SRAM Cache! Rock Solid '386 computing power. Right now, only \$1595.

Your new ZEOS 386SX-20 includes the most advanced SX motherboard available anywhere. Because we've not only added our high speed 64K Static RAM Cache. We've also integrated the hard and floppy drive controllers *plus* the serial, parallel and game ports *right on the motherboard!* This results in even greater reliability *and* expandability.

ZEOS SX SYSTEMS RATED #1!

After all, the ZEOS 386SX-20 comes from a family of *Editor's Choice* '386 systems. And most recently, in PC Magazine's Service and Reliability issue, ZEOS systems received the #1 SX rating overall. When you receive your new ZEOS 386SX you'll see why ZEOS is #1. Take our case and power supply for instance.

Your new system will include our custom 200 Watt power supply and six bay SpaceSaver desktop case. You save space and still have room

for lots of future expandability! And the components in your system will last longer too because ZEOS gives you not just one, but *two cooling fans*. After all, the cooler your system runs, the longer it will last. Now that's uncompromising value. That's ZEOS value.

24 HOUR A DAY TOLL FREE SALES AND TECHNICAL SUPPORT!

Too, you will receive our legendary *ZEOS 24 Hour a Day Toll Free Technical Support*. Plus our full 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and Express Parts Replacement Policy.

Performance. Quality. Price. Support. These are the hallmarks that have made ZEOS America's favorite choice. These are the values that make ZEOS your best choice as well. You're going to be *very* satisfied. We don't just say it. *We Guarantee it.*

**ORDER NOW TOLL FREE:
800-423-5891**

Order your new ZEOS 386SX now with confidence. Your choice of ZEOS quality and performance is Guaranteed. Order now toll free by calling 800-423-5891.

**THE INCREDIBLE
NEW ZEOS
386SX-20 CACHING
SYSTEM. AMERICA'S
#1 CHOICE!**

ONLY \$1595

- Genuine Intel® 80386SX-20 CPU, 8/20MHz.
- Ultra Fast 64K SRAM Cache providing Superior Zero-Wait State performance.
- 512K of Zero-Wait DRAM, expandable to a System Total of 16MB.
- 42MB High Speed IDE hard drive. Teac 1.2MB floppy.
- ZEOS 14" Hi-Res amber monitor with Tilt/Swivel. Includes Genuine Hercules® brand graphics controller!
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two Serial, one Parallel & one Game Port.
- 6-16, 2-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS 6-bay SpaceSaver case with our 200 Watt power supply and two cooling fans for added reliability and product life.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Options Galore: Including 14" 1024 VGA, more memory, an incredible selection of hard drives: SCSI, IDE, ESDI or MFM and virtually any other add-on you could want. Ask about other special money saving packages too.

**ORDER NOW TOLL FREE:
800-423-5891**

FAX Orders: 612-633-1325
In Minnesota: 612-633-4591
Outside US and Canada:
612-633-6131
MasterCard, VISA, Am Exp.,
Z-CARD and COD.
Open 24 Hours a day,
365 Days a year!



All prices and specifications are subject to change without notice. Please call for current pricing and warranty details. ZEOS is a publicly traded company. NASDAQ Symbol: ZEOS. © 1990 ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112. All product and company names are trademarks or registered trademarks of their respective holders.

CIRCLE 487 ON READER SERVICE CARD



Finally, DAT for Computers.

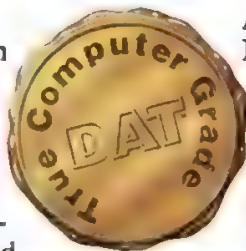
- Looking for the ultimate backup for Local Area Networks? Here's a new generation DAT product you can finally rely on: MaynStream® 1300DAT, True Computer Grade DAT™ from Maynard™ Electronics.

DAT for Performance.

Other DAT products use adapted audio mechanisms. MaynStream 1300DAT was engineered from the ground up for the rigors of computer use. It features advanced electronics and silent operation. Plus an 11 megabyte-per-minute transfer rate and 5 megabyte-per-second burst mode.

DAT for Networks.

Depend on MaynStream 1300DAT for peer-to-peer networking. Novell®-certified MaynStream 3.0 software backs up your entire network, including file servers and workstations. On-disk tape cataloging provides quick restore of backup data to any network location.



Also, it's the perfect backup for popular NetWare® 286 and NetWare 386.

DAT for Capacity.

Finally, MaynStream 1300DAT stores 1,300 megabytes of data on one compact 4mm computer grade DDS standard DAT cassette. All from the leader in tape backup—Maynard Electronics. For more information: call Maynard 1-800-821-8782

Maynard

An ARCHIVE® Company

We're backing you in every way.

Marketing Communications, 36 Skyline Drive
Lake Mary, Florida 32746

1-407-263-3500 (USA) 011-44-494-473-434 (UK)

Maynard is a trademark and MaynStream is a registered trademark of Maynard Electronics, Inc. True Computer Grade DAT is a trademark and Archive is a registered trademark of Archive Corporation. NetWare and Novell are registered trademarks of Novell, Inc.

CIRCLE 495 ON READER SERVICE CARD

by
William S. Hall

Windows

USING THE RECORDER EFFECTIVELY

If you've ever tried to use the Macro Recorder in *Windows* 3.0, then you've probably experienced a little frustration. Using the mouse or the Arrow keys is ineffective, because the size, shape, and locations of your windows—as well as the order of the icons—are constantly changing. The Program Manager may even change the order of Program Groups in its Window pull-down menu between invocations of *Windows* if you have retiled, added, or deleted a program group. Obviously, you cannot rely on the position of a window to help you start a program from a recorder macro.

You can avoid problems by relying on the keyboard instead of the mouse or cursor arrows when recording a macro. Simply click Recorder, hit Alt-F to activate the Program Manager's File menu, hit R to activate the Run command, and then type in the command needed to start the desired application. Once the target window is activated, you can use the mouse more freely, especially if the objects found there maintain a fixed relationship to the client (working) area of the application.

The Calculator is a good example of such a window, since its buttons and entry window are fixed, and its overall size is always the same. On the other hand, you'd want to stick with the keyboard when recording macros in the Calendar, since the visible entries change as you scroll its window through the hours of the day.

If you use your macros often, you may want to start a *Windows* session with the recorder as an icon. To do this, simply modify the WIN.INI's LOAD= line, adding RECORDER.EXE to the list of files. If the load line is empty, then change it to read

LOAD=RECORDER.EXE

Otherwise just add the file to the end of the list.

Steve Mansfield
Lexington, Kentucky

■ **USING THE RECORDER EFFECTIVELY:** The positions, sizes, and shapes of your windows change, so the mouse is useless for recording macros. Stick to the keyboard.

■ **ICONS, ICONS:** *Windows* does offer an icon—even two—for SYSEDIT.EXE, but you'll have to load them yourself.

■ **CUSTOMIZING THE DOS SHELL:** Launch a version of COMMAND.COM that runs its own AUTOEXEC.BAT. This way, you can load your TSRs without stealing memory from *Windows* sessions.



You are quite correct in trying to avoid the mouse when recording macros. As much as possible, even inside your application, use the keyboard interface to reduce dependency on the position of objects.

Because the window size of a program may change each time you run it, recorder commands that depend on the mouse can be affected.

Suppose you've written a macro that goes to a certain place in a Write file, selects a word, and deletes it. If the initial size of the window is large enough to show the word, you can simply move the mouse to the word and select it. But if the window is small, you may have to take some extra steps to make the word visible. In the latter case, your macro may not work. In fact it may wreak havoc. A recorder macro that performed tasks

described above once ruined part of a text file of mine. The word I chose to delete was not visible, but the macro acted as if it were. In such a case, you'll have greater success if you stick to the keyboard and use the search option to find the target.

Fortunately, the Recorder lets you adjust its sensitivity to the mouse. There are three options: Clicks and Drags, Everything, and Ignore Mouse. If you are determined to use only the keyboard, just select the Ignore Mouse in the Record Mouse selection of the Record Macro dialog box.

However, even judicious use of the keyboard does not guarantee smooth sailing. Mr. Mansfield has implicitly assumed that when you execute the macro, the Program Manager has the keyboard's focus. Under this assumption, when you hit Alt-F, then R, and give the program name, you'll start the application you want to run. But if some *other* program has the focus, then the results will be unpredictable: The particular sequence of commands you select may be meaningless or may in fact do something entirely different—in the program that does have the focus. Your macro, then, will fail, or worse, continue to run on blindly.

The solution to this problem is to assign a hotkey to the macro. As long as the Program Manager is running and is not minimized, the hotkey will start the macro. However, if the Program Manager is minimized, then the macro will fail.

In the end it's practically impossible to have a program-launching macro run consistently under all circumstances. Everything goes back to the basic foundation of *Windows*: What you see is a visual picture of the file system and as a result it's almost impossible to set up exact and invariant initial conditions. Complicating the situation, all programs need to start from either the File or Program Manager. If you had a universal way to run a program from, say, the Task Manager, then you could get more predictable results. You could call the Task Manager with

Windows

Ctrl-Esc, enter the name of the program in some (currently nonexistent) RUN command, and then execute it. Unfortunately, this is not possible with the Task Manager today. You never, by the way, experience problems like these in *HP NewWave Environment*.

So, if possible, continue to use the keyboard interface—even inside a program—when recording a macro. In a well-written application, you will be able to use every command in the program without a mouse.

ICONS, ICONS

In the August 1990 issue, you said SYSEDIT can't be associated with an icon. You can, however, assign an icon to it—just as with any other program.

Click on New in the File menu, select Program Item, and click on OK. In the Program Item Properties box, select Browse. If you change the subdirectory to [system] you will see SYSEDIT.EXE. Select it and click on OK. Click on OK in the Program Item Properties box, and *Windows* will create an icon in whatever group window is selected or active.

Tim Klaver

Appleton, Wisconsin



Actually, SYSEDIT already has two icons: one looks something like the old *Windows 2.x* Notepad icon; the second shows several overlapping documents, reflecting the fact that SYSEDIT is really a Multiple Document application like the Program Manager. But the point in the August article was *not* that you couldn't assign an icon to SYSEDIT. Rather it was whether or not you pick one of the two SYSEDIT icons or assign your own, *Windows* doesn't automatically load an icon into a program group at setup time.

You can find the second icon from the Program Item Properties dialog box by selecting Change Icon and then View Next—in the Select Icon dialog box. If you don't like the choices, you can enter another *Windows* executable filename and browse through its icons. For example, ICONLIB.EXE (available from PC MagNet) is *packed* with icons. (See also "Install and Use SYSEDIT" in this issue's cover story, "Tips, Tricks, and Hits for *Windows 3.0*.")

CUSTOMIZING THE DOS SHELL

I recently purchased *Windows 3.0* and have been very impressed with its performance in enhanced mode on my Gateway 386, 20-MHz machine. Nevertheless, I still wanted easy access to the DOS command line. By adding the line LOAD=COMMAND.COM to the WIN.INI

Use the keyboard interface—even inside a program—when recording a macro. In a well-written application, you will be able to use every command in the program without a mouse.

file, I have *Windows* automatically load a DOS shell icon at start-up. However, I am then left with a dilemma. If I load my AUTOEXEC.BAT with all the TSRs needed to make DOS tolerable, I would lose memory in my *Windows* sessions. If I remove those TSRs from the AUTOEXEC.BAT, I wouldn't affect the memory available for *Windows*, but I would have to load them manually in the DOS shell the first time I entered it. Neither method offered the hands-off solution I was looking for. With a little experimentation, I found a way to load a DOS shell that runs its own AUTOEXEC.BAT file. I accomplished this task by using the following steps:

- Copy COMMAND.COM to a new filename. I used WINCMD.COM.
- Using Debug (or another byte-level editor such as the *Norton Utilities*), change the string AUTOEXEC.BAT to AUTOEXEC.WIN in WINCMD.COM (see below for details).
- Create a small program that will execute WINCMD.COM, passing it the parameter /p. (To do this, use the example C program.) If you do not have access to a compiler, a simple batch file can accomplish the same task, but it will cost you

about 5K of memory in the shell.

- Append DOS.XXX to the existing LOAD= in your WIN.INI file. XXX is EXE, COM, or BAT, depending on how you performed the third step.

- Run *Windows*.

If you pass the /p parameter to this patched version of COMMAND.COM, the file becomes the permanent copy of the command processor and runs the AUTOEXEC file. AUTOEXEC.BAT has been changed to AUTOEXEC.WIN, so AUTOEXEC.WIN is what WINCMD.COM executes. The extra program in the third step is required because the LOAD command doesn't let you pass a parameter to the executable file it is loading. The batch file will cost you some memory, because a copy of COMMAND.COM must be loaded to interpret it. COMMAND.COM cannot be released once WINCMD.COM is loaded. Using the **exec** function eliminates this wasted space.

The drawback to this technique is that you can no longer close the DOS window by typing EXIT. To end the *Windows* session, you must use the TERMINATE option in the SETTINGS menu. Microsoft recommends that *Windows* be exited and the machine rebooted after TERMINATE is used. However, I only terminate when I am finished using the computer, so this limitation poses no problem.

Tim Walker

Troy, Michigan



To complete Mr. Walker's helpful tip, here's the C code to execute WINCMD.COM:

```
#include <stdio.h>
#include <process.h>
main()
{
    execl("C:\\wincmd.com",
        "c:\\wincmd.com", "/p",
        NULL);
}
```

Compile it with the Microsoft C compiler using the command

```
cl dos.c
```

to generate DOS.EXE. If you have another compiler, follow the recommended procedure for creating either an .EXE or COM file. If you don't have a compiler, you can create a .BAT file with one line,

```
WINCMD /p
```

Windows

The only complicated part of the whole procedure is patching WINCMD.COM. First, type the command `DEBUG WINCMD.COM`. Then, at the `DEBUG` prompt (-), type the following:

rcx

This instruction will read the number of bytes in the file. Then you must hit Enter. Write down the number returned. You'll now use that number to search the length of the file for the "BAT" string. The command

```
s100 17000 "BAT"
```

will find the two places in the file where "BAT" should be changed to "WIN". In my file, these are at 592B:16B3 and 592B:566B. Only the offset values (the ones after the colon), are important here.

Verify that you have actually located what you were looking for by typing `d` (for display), followed by the offset address. Do this for both addresses. (For my file, I would type `d16B3` and `d566B`.) You

If you see the altered prompt, you performed the patch correctly. You can now customize your AUTOEXEC.WIN.

should see the letters BAT in the ASCII display on the right of the screen.

Now carry out the `examine` command for each offset value and change the three ASCII values for "BAT" to the ones for "WIN". In my case the commands were, respectively,

```
e 16B3 <return> 57 <spacebar> 49
<spacebar> 4E <return>
e 566B <return> 57 <spacebar> 49
<spacebar> 4E <return>
```

Check your work in each instance by typing the display command again and

looking for the letters WIN where BAT used to be.

Finally, write the patched file by typing `w` and then quit with `q`. To test the result, create a simple version of AUTOEXEC.WIN whose sole entry changes your prompt to something different from the normal one. I used this:

```
prompt ALT-ESC for Windows$ _p$g
```

Now execute `WINCMD /p`. If you see the altered prompt, you performed the patch correctly. After this test, reboot your computer.

You can now customize your AUTOEXEC.WIN as suggested above. You might continue to use the test prompt. When you are operating full screen in a DOS shell, it will remind you where you are. This will keep you from mistakenly running Windows again!

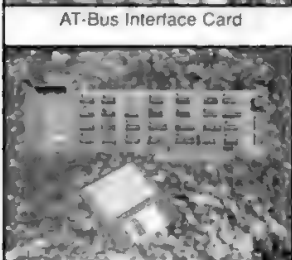
OPENING WINDOWS

Share your experience with the Windows environment. We'll pay \$50 for any tip we print. Mail your contribution on-disk, with a printout, to Windows, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for access instructions). ■

No More Mousin' Around



FT-1000 Precision Light Pen



Micro Channel Interface Card

Draw, point, click, drag, position--FTG's light pen does all this faster, easier and quicker than a mouse and does it without using your valuable desk space. Take a look at a sensible input alternative with FTG's 30-day trial offer.

FTG DATA SYSTEMS

10801 Dale Street
Stanton, CA 90680
714-995-3900 800-962-3900
FAX 714-995-3989



BACKPACK. IT'S A DRIVE OF A DIFFERENT COLOR.



Add a disk drive without horsing around inside your computer—just plug Backpack into your parallel port! Connect your printer to the Backpack drive. No tools. No hassles. No interface cards. Backpack works with IBM and compatibles including PCs, XT's, AT's, PS/2's, PS/1's, and

laptops. It's available in 5.25" and 3.5" and comes complete with everything you need. So see your dealer or get it straight from the horse's mouth and call us about Backpack today!



MicroSolutions
Computer Products
132 W. Lincoln Hwy., DeKalb, IL 60115
815-756-3411 Fax: 756-2928

CIRCLE 390 ON READER SERVICE CARD

Only Time Line Can Say All This,

In This.

"See, the quote came in late and I really like those people so we gave them more time but they still missed the deadline and I had to get others who of course charged us double but they almost made it and then because they were behind it pushed out everything else so I used Time Line over the weekend you know really sweated bullets and on Monday they told me that George called in sick but it's not serious because the surgeon said he'd be back in two or three weeks so I used Time Line again and made a new plan and if it's approved we'll still finish on time unless something comes up that Time Line and I can't handle like an earthquake, a typhoon, or a flood."



Only Time Line®, the #1 Project Manager* lets you say all this, or any part of it, in a single Gantt chart. Because only Time Line gives you unlimited customization options, to help you convert a confusing array of details into a clear, concise, informative schedule. And only Time Line includes Project Presentations™, which combines Time Line's famous power and ease of use with a complete set of graphic tools that clarify details, focus attention, and enhance your image. In Gantt charts and PERT charts printed as crisp laser-printed summaries, huge plotted wall charts, even 35mm slides.

Call today for a free Time Line demo disk. You'll see how Time Line gives you the power to say everything you want... without saying anything at all.

**FREE DEMO DISK, CALL
(800) 228-4122 Ext. 530P**

SYMANTEC.

The #1 Project Manager



Time Line 4.0 received PC World's 1990 World Class Award, and was a recommended product by InfoWorld in April 1990.

Symantec Corporation, 10201 Torre Avenue, Cupertino, CA 95014. 408/253-9600.

*Awards: PC Magazine's Editor's Choice Award, '86, '87, and '88; InfoWorld, Software Digest, and PC Week's highest 1988 ratings. Time Line is also the #1 best-selling project manager (Survey of National Distributors). Time Line is a registered trademark, and Project Presentations is a trademark of Symantec Corporation. © 1990 Symantec Corporation

CIRCLE 264 ON READER SERVICE CARD

by
Sal Ricciardi

Databases

LEFT AND RIGHT PADDING REVISITED

In your September 25, 1990, column, you discussed a reader submission for converting a number to a zero-padded string. That procedure used a combination of the STR(), SUBSTR(), and STUFF() functions, but I think there is a better way. I use the three routines shown in Figure 1, which are much faster and make better use of built-in functions. Here's how they work.

First, the REPLICATE function makes a string of pad characters the full length of the desired result. Then the original string is concatenated to the left or right of the REPLICATED string. Finally, the LEFT or RIGHT function extracts the desired number of characters from one end of the string. The result is only one concatenation, and multiple pad characters are added at assembler speed by the built-in REPLICATE function. The Num2Strg function also shows how UDFs can be called from within other UDFs in order to reduce repetitive programming and consequently save time.

Brent Ashley

Brampton, Ontario, Canada

■ **LEFT AND RIGHT PADDING REVISITED:** Here are some additional fast and flexible techniques for padding numeric strings.

■ **CHOOSING COLORS IN CLIPPER:** Customize the palettes of your *Clipper* applications.



The number of letters I've received with varying techniques for left and right padding testifies to the flexibility of the *dBASE* language; you can do most anything a number of different ways. If your *dBASE* implementation lacks support for the TRANSFORM() function, Mr. Ashley's techniques for converting a number to a zero-padded string are fast, flexible, and concise. They can also handle as many digits as you need. The following examples show the different

results returned by each of these functions:

■ **Example 1:**

```
.? PadLeft("999",12,'0')
```

000000000999

■ **Example 2:**

```
.? PadRight("999",12,'*')
```

999*****

■ **Example 3:**

```
.? Num2Strg(999,12)
```

000000000999

■ **Example 4:**

```
.? Num2Strg(-999,12)
```

00000000-999

■ **Example 5:**

```
.? Num2Strgn(-999,12)
```

-00000000999

I added a fourth routine: a slightly modified version of the Num2Strg function called Num2Strgn. As you can see from Example 5 above, it handles negative numbers better.

CHOOSING COLORS IN CLIPPER

COLORPAR (shown in Figure 2) is a general-purpose procedure for selecting colors that can be incorporated, with some small modifications, in any *Clipper* program. Its design is simple, as it works with matrixes. The BACK matrix is loaded with the available background colors, and the FORE matrix is loaded with the available foreground colors. A color option board is then drawn with all possible selections.

From this board, you can move the cur-

PADDING STRINGS ROUTINES

```
FUNCTION PadLeft
PARAMETERS String,Length,PadChar
* Pad String to left with PadChar to total of {Length} chars
RETURN RIGHT(REPLICATE(PadChar,Length)+String,Length)

FUNCTION PadRight
PARAMETERS String,Length,PadChar
* Pad String to right with PadChar to total of {Length} chars
RETURN LEFT(String+REPLICATE(PadChar,Length),Length)

FUNCTION Num2Strg
PARAMETERS Number,StrgLen
* Convert number to string of length StrgLen, padded to left
* with zeros.
RETURN PadLeft(LTRIM(RTRIM(STR(Number,StrgLen))),StrgLen,"0")

FUNCTION Num2Strgn
PARAMETERS Number,StrgLen
* Convert number to string of length StrgLen, padded to left
* with zeros. Handles negative numbers.
RETURN IIF(Number < 0, "-", "0")+
  PadLeft(LTRIM(RTRIM(STR(ABS(Number),StrgLen))),StrgLen-1,"0")
```

Figure 1: These four user-defined functions can be helpful in producing padded strings.


```

*
* COLOR.PRG - Example use of COLORPAR.PRG
*
SET PROCEDURE TO COLOR
ClrVar=""
ScrBuff = SAVESCREEN(4,21,17,56)  ** Save screen area
@ 4,21 CLEAR TO 17,56             ** Clear the area
@ 4,21 TO 17,56                   ** Box the area
DO COLORPAR WITH ClrVar, 5, 22     ** Get color pair
RESTSCREEN(4,21,17,56,ScrBuff)    ** Restore screen area
RETURN

*****
* COLORPAR - Displays a grid from which you can choose a color pair *
* Usage: DO COLORPAR WITH ClrVar, Irow, Icol
* Where: ClrVar will hold the resulting color pair
*        Irow is the starting row position for display
*        Icol is the starting column position for display
*
* Example: DO COLORPAR WITH WinClr, 15, 25
*****
PROCEDURE COLORPAR
PARAMETERS CLRVAR, IROW, ICOL
PRIVATE SAVECLR, SAVEBLK

SAVEBLK = SETBLINK()              ** Clipper 5.0 specific
SAVECLR = SETCOLOR()              ** Save current color
SETBLINK(.F.)                     ** Clipper 5.0 specific

STORE CHR(87) TO COR

@ IROW, ICOL+2 SAY "Select Color:"

IROW = IROW + 1

DECLARE BACK[8]
BACK[1] = "W"
BACK[2] = "N"
BACK[3] = "B"
BACK[4] = "G"
BACK[5] = "BR"
BACK[6] = "BG"
BACK[7] = "GR"
BACK[8] = "R"

DECLARE FORE[32]
FORE[1] = "W+"
FORE[2] = "W"
FORE[3] = "W++"
FORE[4] = "W+"
FORE[5] = "B+"
FORE[6] = "B"
FORE[7] = "B++"
FORE[8] = "B"
FORE[9] = "G+"
FORE[10] = "G"
FORE[11] = "G++"
FORE[12] = "G"
FORE[13] = "R+"
FORE[14] = "R"
FORE[15] = "R++"
FORE[16] = "R"
FORE[17] = "BR+"
FORE[18] = "BR"
FORE[19] = "BR++"
FORE[20] = "BR"
FORE[21] = "GR+"
FORE[22] = "GR"
FORE[23] = "GR++"
FORE[24] = "GR"
FORE[25] = "BG+"
FORE[26] = "BG"
FORE[27] = "BG++"
FORE[28] = "BG"
FORE[29] = "N+"
FORE[30] = "N"
FORE[31] = "N++"
FORE[32] = "N"

FOR B = 1 TO 8
  FOR F = 1 TO 32
    SETCOR=FORE[F]+"/"+BACK[B]
    SET COLOR TO &SETCOR
    @ IROW+B,ICOL+F SAY COR
  NEXT F
NEXT B

ROW=IROW+1
COL=ICOL+1
BACKCOR=1
FORECOR=1

SET CURSOR OFF

```

```

DO WHILE .T.
  CELLCOR=FORE[FORECOR]+"/"+BACK[BACKCOR]
  SET COLOR TO &CELLCOR

  @ ROW,COL SAY "X"
  @ IROW+8+2, ICOL+8 SAY "This is a sample."

  INKEY(8)

  @ ROW,COL SAY COR

DO CASE

CASE LASTKEY()=4                      **RIGHT
DO CASE
CASE FORECOR=32 .AND. BACKCOR=8
FORECOR=1
BACKCOR=1
ROW=ROW-7
COL=COL-31
CASE FORECOR=32 .AND. BACKCOR<8
FORECOR=1
BACKCOR=BACKCOR+1
ROW=ROW+1
COL=COL-31
OTHERWISE
COL=COL+1
FORECOR=FORECOR+1
ENDCASE

CASE LASTKEY()=19                      **LEFT
DO CASE
CASE FORECOR=1 .AND. BACKCOR=1
FORECOR=32
BACKCOR=8
ROW=ROW+7
COL=COL+31
CASE FORECOR=1 .AND. BACKCOR>1
FORECOR=32
BACKCOR=BACKCOR-1
ROW=ROW-1
COL=COL+31
OTHERWISE
COL=COL-1
FORECOR=FORECOR-1
ENDCASE

CASE LASTKEY()=5                      **UP
DO CASE
CASE FORECOR=1 .AND. BACKCOR=1
FORECOR=32
BACKCOR=8
ROW=ROW+7
COL=COL+31
CASE FORECOR>1 .AND. BACKCOR=1
FORECOR=FORECOR-1
BACKCOR=BACKCOR+7
ROW=ROW+7
COL=COL-1
OTHERWISE
ROW=ROW-1
BACKCOR=BACKCOR-1
ENDCASE

CASE LASTKEY()=24                      **DOWN
DO CASE
CASE FORECOR=32 .AND. BACKCOR=8
FORECOR=1
BACKCOR=1
ROW=ROW-7
COL=COL-31
CASE FORECOR<32 .AND. BACKCOR=8
FORECOR=FORECOR+1
BACKCOR=BACKCOR-7
ROW=ROW-7
COL=COL+1
OTHERWISE
ROW=ROW+1
BACKCOR=BACKCOR+1
ENDCASE

CASE LASTKEY()=13                      **ENTER
EXIT

OTHERWISE
LOOP
ENDCASE

ENDDO
SET CURSOR ON
CLRVAR = FORE[FORECOR]+"/"+BACK[BACKCOR]
SET COLOR TO &SAVECLR                ** Restore original color
SETBLINK(SAVEBLK)                    ** Clipper 5.0 specific
RETURN

```



Figure 2: The COLOR program demonstrates how to use the COLORPAR procedure to select colors that can be incorporated in a *Clipper* program. See Figure 3 for a sample of its output.

THE CHALLENGE

- To Share Printers with up to 16 PC's, Laptops, and PS/2's.
- To Transfer Files, and send E-Mail in background mode at 500,000 bps.
- To find the Most Flexible Topology for easy wiring.
- To choose a Low Cost, Easy to Use product.

THE SOLUTION



3X LINK-16

THE PRINTER SHARING SOLUTION YOU'VE BEEN WAITING FOR!

This is why 3X Link-16 is right for you:

- Links up to 16 computers and shares up to 16 printers and plotters.
- Printers and plotters can be on any computer in the system and can be either serial or parallel devices. A pop-up screen allows you to select printers and paper to be used.
- A powerful spooler allows you to manage your print jobs.
- Transfers files and E-Mail in the background at 500,000 bps. You are no longer limited by slow serial transmissions. And background mode lets you keep on working without interruption.
- Only \$139 per workstation.
- Zero slot technology. 3X Link-16 plugs in between your parallel port and your printer cable. There's no need to buy an interface card or take up a valuable expansion slot!
- Daisy chain cabling with lengths up to 400'! 3X Link-16 requires no hub or ring configuration. This eliminates extra wiring required by other products solely to meet topology requirements.
- Easy to install and use. No special training required.
- Peer to peer operation. There's no dedicated server hardware required.
- Autoscripts save time by letting you automate repetitive tasks.
- Multi-level passwords for added security
- No risk! With 3X USA's 30 Day Money Back Guarantee, you can try our product without risk. What could be safer?

To order, call us today at 800-327-9712

CIRCLE 234 ON READER SERVICE CARD



One Executive Drive, Fort Lee, NJ 07024

Databases

sor in any direction. As the cursor moves from square to square, the active color changes. When moved off one side of the board, the cursor wraps to the other side. Pressing Enter chooses a color.

Paulo Borges
Maputo, Mozambique

PC MAGAZINE This is an interesting approach to providing custom color selection in your applications. I modified Mr. Borges's original procedure slightly, to make it more general and to incorporate *Clipper* 5.0's SETBLINK function. You'll want to remove the *Clipper* 5.0-specific comments if you're using *Clipper* Summer 87.

To use the COLORPAR routine, you pass it the name of a character variable in which to store the chosen color pair and the row and column position at which to display the color-selection grid. The routine saves the current color at entry and restores it before returning the selected color pair in the named variable.

Figure 3: This screenshot shows the display produced by running the program shown in Figure 2.



You might want to incorporate this routine as part of a larger color-selection scheme that assigns colors to specific areas of your application.

LET US HEAR FROM YOU

Share your database experience, tips, and techniques and we'll pay you \$50 for any submission we print. Submissions must be

made on-disk, and be sure to include a printout. Mail your contribution to Databases, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for access instructions).

Sal Ricciardi is a consultant and a frequent contributor to PC Magazine.



"With *Computer Library* I was able to find some unusual hardware for a desperate customer. And within the first two weeks I made a profit of \$700."

—Semyon Roitman, President, Entre Computer Store

Take *Computer Library* out for a spin and you'll be amazed what turns up. For openers, you'll find crucial computer products and information right at your fingertips.

Because *Computer Library* delivers a year's worth of computer articles from over 120 publications like *PC WEEK* and *PC Magazine*. All on a compact disc that's mailed to you each month with new, fully updated information.

So you'll find products when others can't. And be able to watch the reviews to gauge what the best sellers will be. All for \$765 a year.

Call 212-503-4400 to subscribe. And chances are you'll hit the jackpot.



THE ULTIMATE DESKTOP REFERENCE

One Park Avenue, New York, NY 10016

Computer Library is a Trademark of Ziff Communications Company

Wheel of fortune.

HeRe's *WhAt yOU* *CaN* do *wIth Our* *freE OfFeR*

You can also do **this**, **this**, or **this**. Just buy any Canon Laser Beam Printer by March 31, 1991, and get 31 scalable fonts free.

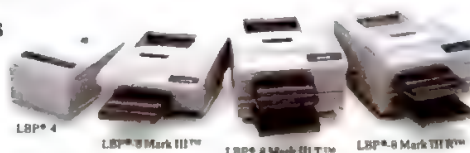
Mix fonts within a single word. Rotate single letters. Even create type big enough to fill an entire page. And all without juggling a single font card or using up valuable disk space.

There are nine scalable fonts built right into the system.

And the free SC-T™ IC Card has 22 more.

Also available is a printer driver kit containing all current printer definition files with complete installation instructions for most popular software.

So pick up a Canon Laser Beam Printer. You may never get the chance to express yourself so freely.



Canon
LASER BEAM PRINTERS

Working To Improve Your Image.™

Call 1-800-848-4123 for more information.

Some printer functions may require memory upgrade. Offer valid in USA only. Void where taxed, restricted or prohibited by law. Purchases must be made January 1 through March 31, 1991. All claims must be postmarked by April 30, 1991. Canon® and LBP® are registered trademarks and SC-T Mark III, Mark III T and Mark III R are trademarks of Canon Inc. © 1991 Canon U.S.A., Inc.

CIRCLE 187 ON READER SERVICE CARD



Now that everyone agrees how a computer should work,

Judging by what you see on magazine covers these days, the world now wants what the Macintosh® computer has always had. And, suddenly, the idea that a personal computer should be easy for people to use has been embraced by virtually every major player.

Well, since "Mac-like" is the promise on every lip, this might be a good time to point out just what a Mac® is like.

What makes a Macintosh a Macintosh is more than cheerful icons, a mouse, pull-down menus and other surface manifestations. Because a Macintosh is a Macintosh from the inside out. Conceived from the chip up to work intuitively and visually.

Because it's truly consistent, the entire family of Macintosh personal computers all run the same software with identical point-and-click simplicity.

Because it's a true system, Macintosh printers and other peripherals all connect together quickly and logically. Just plug them in and turn them on.

Because we engineer both the hardware and its operating software, Macintosh runs with the smooth speed and precision you'd expect from any perfectly integrated design.

And because Macintosh isn't a "graphical" shell grafted on top of a character-based system, it doesn't expend lots of expensive computing power trying to do something it wasn't designed for.

Which is why, for less than it usually costs to buy the software and the high-end hardware needed for a Mac look-alike, you can have the true article.

Instead of making do with a handful of graphicized programs, you can choose from the thousands of highly



try the only one that actually works that way.

innovative business applications developed specifically for Macintosh over the last seven years. And instead of patiently following the long path from yesterday's MS-DOS to Windows in the interim and to OS/2 in the someday, you can make one simple step to Macintosh.

The benefits of that step, according to a new independent study* by Diagnostic Research, Inc., are considerable.

It seems when people have a machine that works like people do, they get more done with it. Information managers in the study gave Macintosh productivity ratings that were 32% higher than for PCs running Windows. Which in practical terms is like getting almost two extra days per week, or 17 more weeks out of a year.

Meanwhile, what would you sacrifice by making the change to Macintosh?

Not your PC files. Every Macintosh equipped with an Apple® SuperDrive™ disk drive moves information easily between a Macintosh and an MS-DOS or OS/2 PC on industry-standard, 3½-inch floppy disks.

And not your PC programs, either. With products like Mac286 a Macintosh can run virtually any DOS application. We invite you to call 800-538-9696, ext. 875, for the names of your nearest authorized Apple resellers.

Then come in and see what inspired the monumental changes you've been reading about.

After all, now that everybody else is trying to sell you a Macintosh, maybe you should buy one.

The power to be your best.™



MS-DOS and Windows are registered trademarks of Microsoft Corporation. OS/2 is a registered trademark of International Business Machines, Inc. Mac286 is a trademark of Orange Micro, Inc. Fortune 1000 includes Fortune 500 and Fortune Service 500, which are registered trademarks of Time, Inc. Reprinted from PC Magazine 9/12/89 and PC Week 10/30/89 © 1989 Ziff Communications Co.

CIRCLE 251 ON READER SERVICE CARD

Call now
for your
FREE DEMO DISK
(212) 503-4400



Tracking device.

"For us, Computer Library is essential to tracking computer product trends and marketing events. We can locate everything that's been written about our clients' products~and the competition~just by pressing a few buttons. That makes Computer Library indispensable to us. You couldn't take it away if you tried."

*~Mike Kelly, President, Techtel Corporation,
PC Industry Market Research*

The best way to keep an eye on the market is to keep your hands on

Computer Library is a trademark of Ziff Communications Company.

Computer Library. Because it delivers a year's worth of information from over 120 computer, technical, and business periodicals on a single compact disc. Which means you can tap into information that up until now you could never find.

All you do is type in a word, press a button, and *Computer Library* instantly races through over 55,000 articles and abstracts to find exactly what you need from magazines like PC WEEK, PC/Computing, Government Computer News, and PC Magazine.

So you'll be able to read reviews of almost any product, learn what the experts think about industry technology and trends. Plus, pick up product tips you won't find in any manuals. And each month you'll receive a fully-updated compact disc packed with all the latest information so you're always up to date.

Call 212-503-4400 to subscribe for just \$765 a year. And see how easy it is to get a better view of the market.

THE ULTIMATE DESKTOP REFERENCE



CIRCLE 158 ON READER SERVICE CARD

Computer Library, One Park Avenue, New York, NY 10016

by
Craig Stinson

Spreadsheets

ALTERNATIVE @D360

In your September 25, 1990, column, you printed a *Lotus 1-2-3*, Release 2.x, formula that emulates Release 3's @D360 function. Neither your formula nor the Release 3 function conforms to American securities industry criteria. Under very common circumstances, both your formula and @D360 will return the wrong answer. The error could throw off an interest rate calculation by tens of thousands of dollars.

According to the 30/360-day count used by the securities industry, the formulas return the wrong number of days when the following conditions are true: The ending date is the 31st (of any month) and the starting date is prior to the 30th (of any month). These circumstances imply an end-of-month settlement or valuation, so there is a high likelihood of their occurring together.

The National Association of Securities Dealers (NASD) and the Municipal Securities Rulemaking Board (MSRB) require the day count convention described by the Securities Industry Association Publication, *Standard Securities Calculation Methods*, by Spence, Graudenz, and Lynch. When the ending date is the 31st, you must also check to see if the starting date is the 30th or the 31st. If the starting date is either the 30th or the 31st, the ending date should be changed to the 30th. Otherwise, the ending date must remain the 31st.

Following this rule then, the correct formula for calculating the number of days elapsed on a 30/360-day basis is

```
((360*@YEAR(END))
+(30*@MONTH(END))
+(@IF(@DAY(END)=31#AND#@DAY(START)
>=30,30,@DAY(END)))
-((360*@YEAR(START))
+(30*@MONTH(START))
+(@IF(@DAY(START)=31,30,
@DAY(START))))
```

This formula is much like the one you published in the September 25 column,

■ **ALTERNATIVE @D360:** *Lotus 1-2-3's @D360 function uses the German securities industry guidelines to calculate the difference between two dates. Here's a formula for American users.*

■ **EXCEL AND PROJECT MANAGEMENT:** Create Gantt charts from the plain horizontal stacked bar variety.

but an example using each will show the difference in results. Let's suppose that you want to calculate the number of days between 12/15/90 and 12/31/90. The @D360 function returns 15 days, as does the formula you published. Using the formula above, you'll get the correct answer, which is actually 16 days.

This discrepancy may seem truly arcane, but someone is going to incorporate the formula you published in a real-

world transaction. For instance, if you use the incorrect formulas to calculate accrued interest on a single \$5,000 municipal bond at a 7 percent coupon, you'll overstate the result by \$0.97. But the consequences for the same error on a typical \$100,000,000 transaction amount to \$19,400. (Don't laugh; it's real money.)

Frank R. Hoadley
Madison, Wisconsin



A spokesperson for Lotus Development Corp. says that the @D360 function does return the wrong value under the circumstances cited by Mr. Hoadley. More precisely, the function is in error according to the conventions of the United States securities industry. Its results are correct by the standards of the German securities industry, however.

According to the spokesperson, Lotus incorporated the @D360 function into Release 3 in response to demand from users in Germany, so the company wrote it to meet the needs of *those* users. Since all international variants of Lotus's spreadsheets share a common code base, there was no way to modify the function to make it generate the correct numbers for American users!

Lotus also says it might add a second

DAY360 REVISED		COMPLETE LISTING
	A	
1	DAY360	
2	=ARGUMENT("Start")	
3	=ARGUMENT("End")	
4	=360*YEAR(End)	
5	=30*MONTH(End)	
6	=IF(AND(DAY(End)=31,DAY(Start)>=30),30,DAY(End))	
7	=SUM(A4:A6)	
8	=360*YEAR(Start)	
9	=30*MONTH(Start)	
10	=IF(DAY(Start)=31,30,DAY(Start))	
11	=SUM(A8:A10)	
12	=A7-A11	
13	=RETURN(A12)	

Figure 1: This *Excel* user-defined function finds the difference between two dates based on the 30/360-day year. The function was originally published in an earlier issue, and this revision takes into account certain securities industry conventions.

Spreadsheets

@D360 function for the benefit of users in this country. The two functions would then exist side by side in future versions of 1-2-3. In the meantime, please replace our September 25 formula in your library with Mr. Hoadley's corrected version.

In our September 25 column, we also published a user-defined *Microsoft Excel* function to emulate the Lotus @D360 function. If you do 30/360-day calculations in *Excel 2.x*, however, please do not use the function we published earlier. A corrected version appears in Figure 1.

EXCEL AND PROJECT MANAGEMENT

Through graphing, *Microsoft Excel* offers a good, inexpensive project management

Through graphing,
Excel offers a good
inexpensive project
management tool.

tool. Using the horizontal stacked bar chart, you can create Gantt charts. Simply create a new worksheet, list your project's tasks in one column. In the next three columns list each task's start date, number of days completed, and number of days remaining. Create a chart with this data and change the color and border of the first series (start dates) to the background color. (This makes the data invis-

ible.) Format the scale of the time axis to the start and end dates you wish to show.

You can easily modify the schedule data of your project tasks with any *Excel* formula. This flexible tool allows you to specify in great detail how the schedules of your project's tasks are linked together. It's certainly less expensive and, in many ways, more flexible than dedicated project-management software.

Matthew Pepin
Beavercreek, Ohio



Further proof that the spreadsheet is the genuine all-purpose software tool? Perhaps. Along with this letter, Mr. Pepin enclosed two printouts—one of some worksheet data and one of an *Excel* Gantt chart. So that I might evaluate its worth as a project manager, I booted *Excel 2.1*, re-created Mr. Pepin's worksheet, and began fooling around with the Chart commands. It took me about a half hour to produce the table and chart that are shown in Figures 2 and 3. (The actual worksheet on which Figure 2 is based is too large to fit in a single screenshot.) In order to make the most essential details visible, I have hidden rows 9 through 25 as well as column G.

Mr. Pepin's enthusiasm notwithstanding, I don't think *Excel* is going to put *Timeline*, *Microsoft Project*, or any other project manager out of business. But it does do a decent imitation of a Gantt chart. For those who want to experiment with Mr. Pepin's approach, here are the steps you must follow to turn data structured as in Figure 2 into the kind of chart shown in Figure 3.

First, you must select the data to be plotted, including both the task names in column A and the column headings in row 1. In the worksheet shown here, you would select A1:D36.

Next, open a new chart window (or just press F11). *Excel* gives you its default—a vertically oriented bar chart with each data series plotted side by side. You need a horizontal bar chart with the series stacked, so pull down the Gallery menu, choose Bar, and select the stacked option—it's the third picture in the Gallery.

Now you have an odd-looking bar chart, in which project names appear along the vertical (category) axis and dates appear along the horizontal (value) axis. *Excel* automatically scales its value axis beginning at 0 when all the plotted values are positive, so the starting date in this chart is January 1, 1900 (formatted as Jan-00).

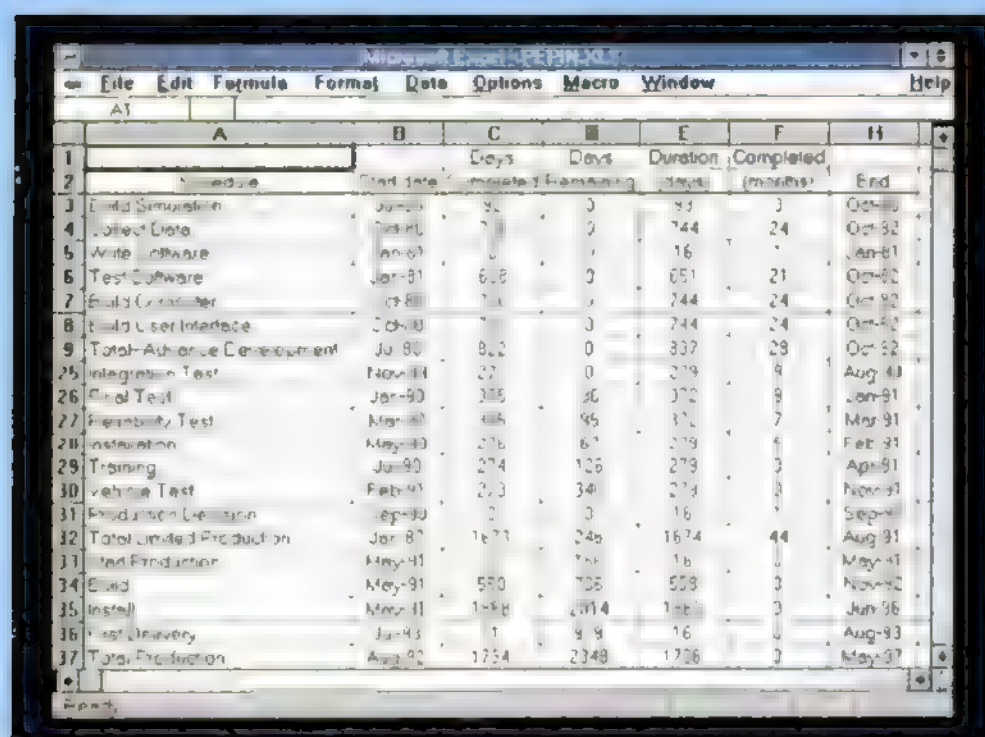
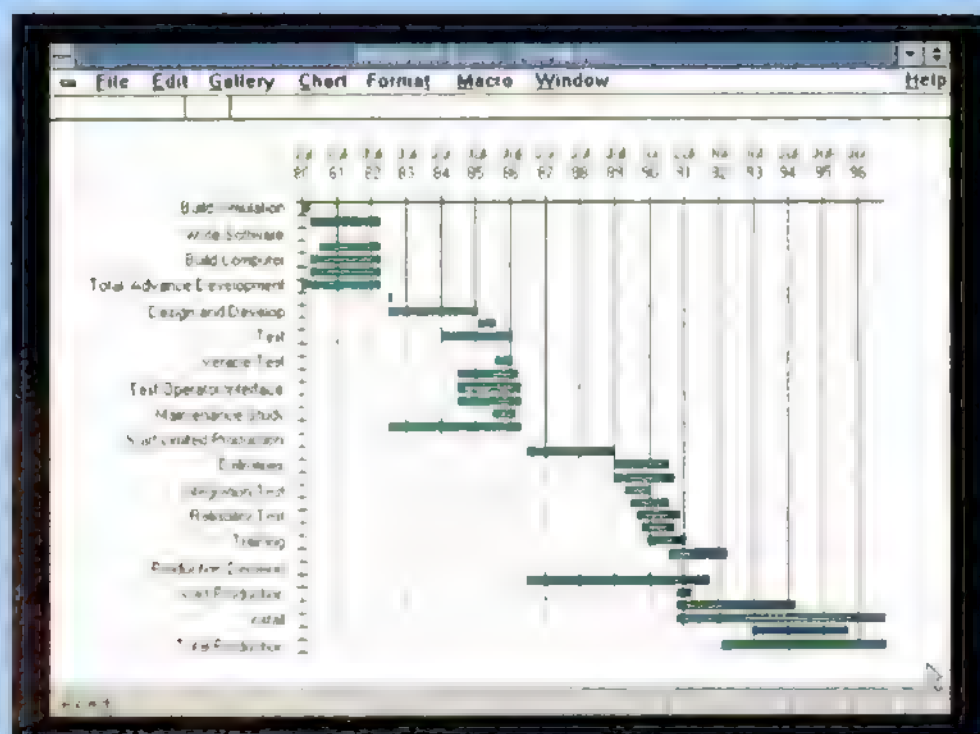


Figure 2: This *Excel* worksheet lists project tasks and several columns of data about their scheduled duration. The information is used to create the Gantt chart shown in Figure 3.

Figure 3: This Gantt chart, created from the data in Figure 2, is actually a converted horizontal stacked bar chart. While *Excel* may not replace full-service project management applications, it offers an inexpensive alternative to some tools.



SPEED. GUARANTEED.



Here's a chance to buy our \$99 Math Coprocessor at no risk whatsoever! It's fully guaranteed to at least double the math performance of your software.

If you want to unlock the full power of your PC, pick up the phone and order an AMD 80C287 math coprocessor. Without it, your PC just isn't really complete. You see, our math coprocessor can *dramatically* increase the performance of 1-2-3®, dBASE®, Excel, and hundreds of your other favorite business applications! It actually runs calculations *two to ten times faster* than your PC can *without* a math coprocessor. Which means your graphs will draw incredibly fast and your spreadsheets will recalculate at truly blazing speeds. (And that's just for starters!)

High speed at a low price.

Don't think you have to pay over \$200 for a math coprocessor. Now you can get ours for just \$99 when you order direct from AMD! The AMD 80C287 is fully compatible with your 80286-based PC and the hundreds of commercially available software packages written for it. Our coprocessor is also compatible with the Intel NMOS 80287.

Installation is a snap.

The AMD 80C287 plugs easily into a socket that's already inside your 80286-based PC. In fact, you can be up and running in just five minutes. Simply plug the chip into the socket and watch the dazzling improvement in performance! The AMD 80C287 comes with easy-to-follow installation instructions, a free utilities disk (which includes diagnostics and test software), and free color computer games.

Advanced Micro Devices, Inc. 

9020-11 Capital of Texas Hwy N., Suite 400
Austin, TX 78759-9797

Volume or dealer inquiries welcome. 1-2-3 is a registered trademark of Lotus Development Corporation. dBASE is a trademark of Ashton-Tate Corporation. Intel is a registered trademark of Intel Corporation.
CIRCLE 197 ON READER SERVICE CARD

Our Triple Guarantee

Guarantee #1: If the AMD 80C287 doesn't do everything we promise, or if you are unsatisfied for any reason, return the product within 30 days of purchase and AMD will happily refund your money.

Guarantee #2: If your AMD 80C287 Math Coprocessor ever fails to perform for any reason, AMD will replace it free of charge, no questions asked. Limited to two lifetime replacements per person.

Guarantee #3: AMD guarantees that the AMD 80C287 is fully compatible with your 80286-based hardware and software. If you have any compatibility problems with the AMD 80C287 during the first year, return the product and we will gladly refund the purchase price.

To Order Call Now

1-800-888-5590 ext. 2400

Outside of USA call (512) 345-1728



Yes. I want to double or triple the calculation speed of software running on my 286-based PC. Send me an AMD 80C287 Math Coprocessor, risk free, for only \$99 plus tax, shipping and handling. I understand that I can return the AMD 80C287 for a full refund within the first 30 days if I am not completely satisfied.

Want more information? Call for a free demo disk and literature.

NAME _____

ADDRESS _____

CITY/STATE/ZIP _____

Visa/MC# _____

Type of PC _____



Computers, FCC Class A, Class B, and You — or When is it better to get a B than an A?

You need to know the difference between computers that meet the FCC class B radio frequency emissions standards and those that meet only the Class A standards.

Computers emit radio signals in their operation. Because these signals may cause interference to radio and television reception, the marketing and the use of computers is regulated by the Federal Communications Commission. Under federal rules, computer users are responsible for remedying interference, including interference in neighboring homes.

Computers certified by the FCC as meeting the Class B standard are less likely to cause interference to radio and TV reception than those that have been verified by the manufacturer or importer to the Class A standards. Only Class B certified computers may be advertised, sold, or leased for use in residences. A similar regulatory program applies in Canada.

Buyers seeking computers for use in homes (including offices at home) should shop for computers and peripherals which have been Class B certified. These devices carry a label with an FCC ID number. Both new and used Class A verified devices may be sold only for use in commercial and industrial locations. Signals from computers are more likely to be masked by electrical noise from other equipment in such an environment. These areas are also likely to have fewer radios and TVs. Accordingly, equipment marketed only for use in these locations may meet the less rigorous Class A standard. Class B certified equipment may be marketed for use in residences as well as commercial and industrial locations.

As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.

Spreadsheets

You'll fix that in a moment.

The chart now consists of a set of tri-colored horizontal bars. The first bars (red) represent the time from January 1, 1900, to each task's starting date. The next component (green) represents the number of days elapsed since the starting date, and the third component (blue) represents the number of days remaining until the task's scheduled completion. Note: some of the tasks listed in Figure 3 have already been completed, so they have no blue component.

You're not interested in the number of days between starting dates and January

Excel's ability to create Gantt charts is not a feature that Microsoft is likely to advertise, but it will serve nicely for basic task tracking.

1, 1900, so you'll want to make the red segments invisible. Start by double-clicking any red bar. That brings up the Patterns dialog box for the first data series. In the Border portion of the dialog box, choose Invisible. In the Area portion, set both background and foreground color to white. Click OK, and you have a set of ghosts for your first data series.

The next task is to adjust the horizontal axis scale. A good starting point for the scale would be the starting date for your first task—which, in Figure 2's data, is July 1, 1980. The serial date value for July 1, 1980 is 29403. (You can determine that by using the DATE function in a blank worksheet cell.) A good ending date for the scale is the completion date of your last task—in this case, May 1, 1997, which has a serial date value of 35551. To make these the end points of your horizontal axis, select that axis, then choose the Format menu's Scale com-

mand, enter the serial values 29403 and 35551 for Minimum and Maximum, respectively, and click OK.

Now the axis has usable end points, but the tick labels probably occur at meaningless intervals. To make the labels appear at the beginning of each year, select the axis again, choose the Scale command again, enter 366 in the box labeled Major Unit, and click OK. (If your project spans a shorter time period than Mr. Pepin's and you want monthly tick labels, you would specify 31 as your Major Unit.)

The horizontal axis is fine now, but the vertical axis is scaled with the last task at the bottom and the first at the top. To reverse that order, select the vertical axis and choose the Scale command. In the dialog box, select the check box labeled Categories in Reverse Order and then click OK.

Now the tasks are listed in the right order. But if your project has as many tasks as Mr. Pepin's and you're working with an ordinary VGA display, *Excel* doesn't have space to display all the task names. (They'll show up when you print, but on-screen many of them are omitted.) You can correct that problem by changing to a smaller font. The default font for most of *Excel*'s chart text is 10-point Helvetica. Eight-point Helvetica will serve you better. To switch, select the entire chart area. (The easiest way to select the entire chart area is to choose the Chart menu's Select Chart command.) Then choose the Format menu's Font command. In the dialog box, choose 8-point Helv (or another font smaller than 10-point Helv).

One final touch: Pull down the Chart menu, choose Gridlines, and select Major Gridlines for the y-axis. *Excel* will then draw vertical lines through the chart to delineate the years (or whatever other time interval you're working with).

That's all there is to it. It's not a feature that Microsoft is likely to advertise, but the tool will serve nicely for basic task-tracking.

HINTS, TIPS, QUESTIONS

Share your latest spreadsheet discovery through *PC Magazine's* Spreadsheets. We'll pay you \$50 for anything we print. Please submit your letter on a disk, together with a printout. Mail your contributions to Spreadsheets, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access instructions). ■

by
Costa Rodis

The Working Word

BULLETS, ACCENTS, AND SYMBOLS

It's not easy to remember which character sets bullets are located in. In *WordPerfect* 5.0 or 5.1 you can sidestep the search by using the Compose Key. Simply press Ctrl-V and then the asterisk. The next character you key in will determine the type of bullet inserted. For example, entering Ctrl-V followed by the keys *, would insert a small filled bullet (•). Figure 1 (left column) lists several keys and the type of bullets they generate.

You can also use Ctrl-V to generate fractions. Press the key combination and then /2 or /4. The former entry will insert ½ and the latter, ¼.

Debra Faulkner
Framingham, Massachusetts



Ms. Faulkner's handy Compose Key shortcuts are just a few of the things you can do in *WordPerfect* 5.0 and 5.1 without consulting the 12 character sets that are listed in the appendices of the manual. Under the Compose description in the *WordPerfect* manual, you'll see lists of the characters that you can create with just four quick keystrokes. Figure 1 (right column) shows five examples.

As other readers have pointed out, diacriticals can also be created with simple mnemonic keystrokes. If you are writing to a friend in France and wish to tell him he has élan, press Ctrl-V, then 'e. If you

ASCII ON THE FLY	
• = •	, c = ¢
* = *	L- = £
o = °	P = ¶
O = O	?? = ¿

Figure 1: Bullets (left column) and several other ASCII characters (right column) you can create using the Compose key, Ctrl-V.

- **BULLETS, ACCENTS, AND SYMBOLS:** In *WordPerfect*, you can add a full range of ASCII characters with four simple keystrokes.
- **GRAPHIC REVIEW:** Use this *WordPerfect* macro to view all your graphic images from one file.
- **INSERTING DOS INFORMATION INTO WORD:** You can use a macro command to run batch files from the shell and retrieve any DOS information.

are drinking a Piña Colada, press Ctrl-V then n. Anyone needing special symbols can quickly access them without going to the trouble of creating a macro for each symbol.

In fact, it doesn't hurt to try composing a special symbol by guessing at the two characters that combine to make it. For example, it seems logical that you would create a not-equal sign (≠), with the equal sign (=) and foreslash (/). Or create ¥ with the combination Y =. The order of the composed characters does not matter.

If the symbol you want is not part of the extended ASCII set, don't worry if all you see is a rectangular bullet (■): People with EGA or VGA displays who select the 512 characters option from Setup (Shift-F1) can see 256 characters that would normally be invisible. To see any character that does not appear on the screen, view it with Print Preview (Shift-F7, V).

Those of you who use CGA or Hercules displays cannot view *all* 512 ASCII

characters. Moreover, the characters you can access will be visible *only* in Print View.

GRAPHIC REVIEW

If you've ever created your own graphics images with *DrawPerfect* or another graphics program, you know how cumbersome it is to review them simultaneously in *WordPerfect*. Your troubles are over with the *WordPerfect* 5.1 macro shown in Figure 2. This macro retrieves the images you specify and merges them into one file. The only thing you are required to do is edit the code so that it specifies the location of the files. There is no limit to the number of graphics you can insert into a single document. But by adjusting the margins and graphics sizes, you can fit more on your screen.

Darren L. Matthews
PC MagNet



Mr. Matthews has devised a nimble solution for anyone who frequently uses graphics images with *WordPerfect*. As he points out, you simply change the third line of the macro so that the pathname matches the one where you keep your files. You can import Computer Graphics Metafile, *AutoCAD*, Encapsulated PostScript, *GEM Draw*, Hewlett-Packard Graphics Language, *PC Paintbrush*, *Lotus 1-2-3 .PIC*, Tagged-Image File, and several other graphics formats (a full list appears on pages 279 and 280 of the *WordPerfect* manual).

When images are retrieved into a *WordPerfect* graphics box, the program automatically converts them into its own .WPG format. It isn't likely that more than one kind of graphics image will reside in a single directory. So you may want to make several copies of the macro, each with an appropriate name and path. For example, if you want to assemble all the .WPG images in the C:\WP51\GRAPHICS directory, simply copy the macro to the name WPGGRAPHIC.WPM. Similarly, you could assemble a pictorial list of all *Har-*

The Working Word

vard Graphics files with a separate version of the macro called EPSIMAGE.WPM or CGMIMAGE.WPM. Keep this version as well as the files in the directory C:\HARVARD.

The Shell command used in line 2 of the macro demonstrates *WordPerfect's* ability to perform a single DOS function from within the program. By having the macro shell out to DOS, Mr. Matthews can create an editable list of all graphics files. In the long run, you will end up having much more trouble trying to accomplish the same task by printing a list of documents (F5) to a file. The macro would need to assess the number of spaces, if any, that exist between a document name and its extension. The macro would then have to remove those spaces and continue on with the chore of blocking each name consecutively for transfer to a graphics box.

The ability to insert DOS-generated information into a document is not limited to *WordPerfect*, as the letter below demonstrates.

INSERTING DOS INFORMATION INTO WORD

You can increase the power of a *Microsoft Word* macro by linking it to a batch file or BASIC program. For example, I have a small batch file find utility. The macro queries the user for the filespec and then calls the batch file (through Library Run) with *filespec* as a parameter. This approach is limited in that *Word* has no direct way to import the information returned by the batch file. I circumvented this limitation with the following line:

```
Echo data >datafile
```

which makes the batch file write information to a data file. The macro then merges the data file into a text file, MACRO.DAT, and reads it. The macro code for this operation is

```
<Enter2><Up><Esc>TMC:\system\  
macro.dat<Enter>  
  
<Backspace><F7>"SET STATUS=  
SELECTION"/<Del2>
```

STATUS now equals the information returned by the batch file, and the macro has cleaned up after itself. Change the

code if more than a one-word response is expected. That is, change the number of deletions or backspaces, depending on the amount of text. You should also accommodate any Returns. Any macro can use MACRO.DAT, which should be tucked away where users are unlikely to edit or delete it.

John East
Oxnard, California



To create a *Word* macro such as Mr. East's, hold down Shift and tap the F3 key. Type the commands and text, then press Shift-F3 to end recording. Finally, assign a name to the macro. You can start the macro by choosing Insert and entering the macro name. Tapping the F1 key will call up a list of available macros.

I tried Mr. East's macro out on an 80286 with DOS 3.3. It ran without a problem. However, it failed to run when I used a 386 machine and DOS 4.01. With the second setup, I encountered a file-sharing allocation error when the macro was run more than once. When I exited and then returned to *Word*, the error disappeared—but only until the macro was run again. Playing with SHARE and other DOS tricks did not remove the error message. The macro *did* complete its task each time, despite DOS's disapproval, but those of you using DOS 4.0x may not experience smooth running.

In any case, a *Word* 5.0 macro is not necessary to run a DOS batch file or a BASIC program and then retrieve the results; Mr. East's macro just takes fewer key-strokes.

The "manual" process is simple. Choose Library Run and enter the path and name of the batch file or BASIC program. You are then prompted to strike any key to return to *Word*. Next, choose Transfer Merge and enter the path and name of the file created by the previous command. Voilà, that text has been inserted into your document at the current position of the cursor.

TIPS FROM WORKING WORDSMITHS

Tell fellow users about your latest word processing tips and we'll pay you \$50 for any tip we print. Please send your letter on a disk along with a printout. Mail your contribution to The Working Word, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for access instructions). ■

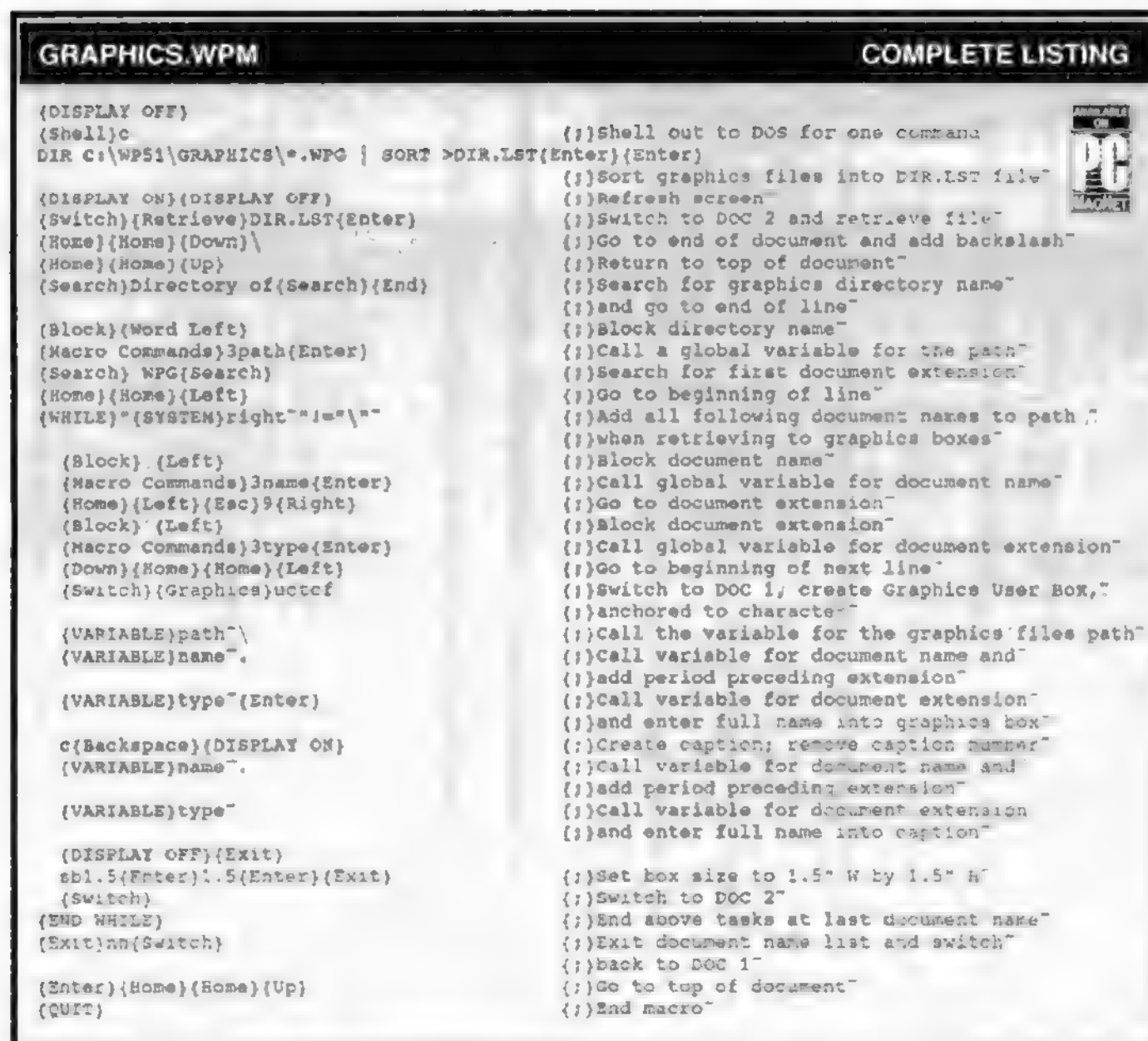


Figure 2: This macro lets you merge all graphics files of a particular format (and path) into one file, making them much easier to review.

\$3,000,000.00

SAYS WE KNOW WHAT WE'RE TALKING ABOUT...



When it comes to helping you make the right PC choices, *PC Magazine* puts its money where its mouth is.

We've spent over \$3 million making our PC Labs the foremost PC testing facility in the world. Add another \$1 million for new benchmark tests — plus an annual working budget of \$2.5 million a year — and you've got a solid gold commitment to readers like yourself.

The fact is, we do more product testing than any other magazine, including *Consumer Reports*. That means that when you subscribe,

you can count on having the best data available on the PC products you need to buy — from lap-tops to printers to VGA cards.

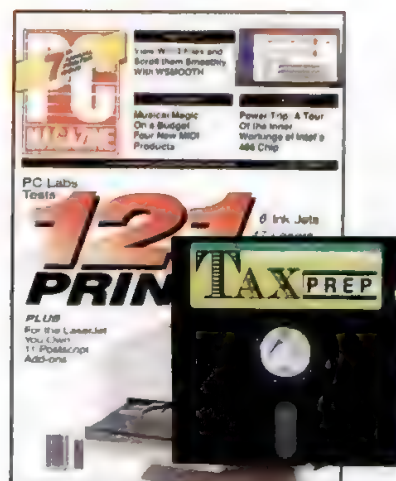
So don't delay. Join us today and you'll receive the exclusive Tax Prep Disk—answers all your tax questions at the touch of a key—FREE with your paid subscription!

Special Savings Offer: Act now to get the Free Software and Save up to 62%!

■ One year (22 issues) for \$29.97 — Save 54%!

■ Two year (44 issues) for \$49.97 — Save 62%!

Savings based on annual newsstand price of \$64.90.
Regular annual subscription price is \$44.97.



**For faster service call:
1-800-289-0429**



THE BEST PC INFORMATION THAT MONEY CAN BUY.



Make PC MAGAZINE Come Alive!

Join PC MagNet and have instant access to PC MAGAZINE's programs and product reviews.

PC MagNet is *PC MAGAZINE's* on-line information service, which is administered by CompuServe. A PC MagNet account gives you:

- Access to all of *PC MAGAZINE's* utilities and programs
- The latest PC Labs Benchmark tests
- New versions of *PC MAGAZINE's* utilities
- A way to talk directly with *PC MAGAZINE* editors and columnists
- On-line support for our programs in the forums
- Direct entry to the Computer Library family of databases
- A downloadable-index to *PC MAGAZINE's* product reviews

One call gets you started!

Sign up on-line at no additional charge.

1. To subscribe, set your communications software for either 300, 1,200 or 2,400 bps, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest your dialing exchange, dial (800) FIND CIS (346-3247). When the modem connects, press <Enter>. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you. After you have found the phone number, hang up and dial using the number you just found.
2. When you receive a CONNECT or CARRIER DETECTED message, enter **Ctrl-C**.
3. At the HOST NAME prompt, enter **CIS**.
4. At the USER ID prompt, enter **177000,5000**.
5. At the PASSWORD prompt, enter **PC*MAGNET**.
6. At the Enter agreement number prompt, enter **210D9000**.
7. Register your name and enter your **VISA, MasterCard, or American Express** account number. You may choose to have your company billed directly by choosing Business Account Invoicing. For more information about Business Account Invoicing, call (800) 848-8199.
8. Your personal **User ID** number and **Password** will be displayed at the end of the subscription process. Please record them in a secure place.
9. A new password will arrive in the mail within 10 days to confirm your subscription.

There are no connect charges for PC MagNet during the subscription process. PC MagNet costs \$12.80 an hour for 1,200/2,400-bps service and \$6.30 for 300-bps, via MasterCard, VISA, or American Express. For assistance regarding passwords, membership, billing or payment terms, call Customer Assistance at (800) 848-8990; outside the United States, call (614) 457-8650. There are no upfront subscription fees, or monthly charges. You pay only for the time spent on-line.

CompuServe members can join by entering GO PCMAG at any CompuServe prompt.



by
Neil J. Rubenking

User-to-User

FINDING ERRORS

I've always been frustrated by the inability of a batch file to test the output of other programs and branch according to the results. As an office manager with responsibility for several PCs, I thought it would be ideal if users could run batch files that would call various disk-test programs and signal for help if the output showed errors.

I've discovered that this can be done using FIND.EXE with the /C switch, which counts the number of instances of a text string in a file. Testing the results of CHKDSK from a batch file involves creating two batch files with a text editor, the first of which should look like CHEKCHK.BAT (Figure 1).

The first line of the batch file directs CHKDSK's output to a file called CHKDSK.TXT. Because CHKDSK

■ **FINDING ERRORS:**
Analyze and act on DOS command output by piping it through the FIND filter.

■ **ROTATING BACKUPS:**
It's best to rotate several sets of backups—these batch files make it easy.

on the disk, OUTPUT.BAT will contain the following:

----- CHKDSK.TXT: 1

OUTPUT.BAT tells DOS to execute a file

input the program might need, such as a Y or N response. If a given program requires a series of responses, PC Magazine's KEY-FAKE.COM can be used to supply the proper keystrokes.

[You can download KEY-FAKE.COM from the Utilities Database of PC Mag-Net.—Ed.]

You should note that using the /F switch with the CHKDSK command suppresses CHKDSK's general "Errors found" message, so using it in CHEKCHK.BAT renders the batch program pointless. Also, it's important to make sure that the search string in the FIND statement is in the proper case, as FIND's searches are case-sensitive, and don't forget to enclose the string in quotes.

John D. Gatto
St. Joseph, Mississippi

CHEKCHK.BAT

COMPLETE LISTING

```
ECHO N | CHKDSK > CHKDSK.TXT
FIND /C "Errors found" CHKDSK.TXT > OUTPUT.BAT
OUTPUT
```



Figure 1: CHKDSK doesn't return an ERRORLEVEL when it finds trouble, but this batch file can detect any errors.

prompts for a yes or no response to fix errors found on the disk, you need to pipe an N to CHKDSK. (A Y response would do as well, because CHKDSK never modifies the disk unless the /F (fix) parameter is present). If CHKDSK doesn't find any errors, the N or Y goes into the bit bucket.

The second line uses FIND to search CHKDSK.TXT for the string "Errors found". CHKDSK always generates this string if it finds errors and the /F parameter is not present. The batch file redirects FIND's output to OUTPUT.BAT, and the third line calls OUTPUT.BAT.

When used with the /C switch, FIND outputs a line of ten hyphens followed by a space, the input filename, a colon, another space, and the number of times the search string was found. If CHKDSK found errors

named "-----" (DOS ignores the last two hyphens) with CHKDSK.TXT: and 1 as parameters. To test the results of the search, create -----.BAT, which should look like Figure 2.

The idea here is that the second parameter (%2) is the number of occurrences of the search string. It can be subjected to any number of IF tests and subsequent branches. If there are no errors, %2 equals 0 and the program prints the "OK" message. If any errors occurred, %2 does not equal 0, and the program prints the warning message to the screen.

You can use this technique to test the output of any program with redirectable output. The tricky part of the procedure lies in determining what program messages to search for and making sure to pipe in any

Many DOS commands and utilities signal errors by setting the DOS ERRORLEVEL, which you can check with the IF ERRORLEVEL batch command and then use to implement responses based on conditional logic. For example, if the XCOPY command halts because the destination disk is full, it sets a nonzero ERRORLEVEL. But CHKDSK is dumb—it doesn't set an ERRORLEVEL, so you have to resort to other methods to analyze its output.

-----.BAT

COMPLETE LISTING

```
@ECHO OFF
IF '%2'=='0' GOTO OK
ECHO.
ECHO DISK ERRORS FOUND.
ECHO Please notify the
ECHO manager immediately!
ECHO.
GOTO END
:OK
ECHO Disk checks out OK
:END
```



Figure 2: The second parameter to this batch file will be 0 if CHKDSK found no errors, 1 if it found errors, and the program will display an appropriate message.



NOT EVERYONE IN BUSINESS

PC MAGAZINE ATTRACTS ONLY THOSE 750,000 BUSINESS PEOPLE HUNGRY FOR THE MOST EXTENSIVE P



SS RELISHES PC MAGAZINE.

PRODUCT INFORMATION. THE BRAND SPECIFIERS. CALL 212-503-5116 TO GET COOKING.



JUST FOR BUYERS WHO MEAN BUSINESS.

User-to-User

You can avoid the step of creating CHKDSK.TXT, if you wish. Pipe the output of CHKDSK directly to FIND with a line like this:

```
ECHO N | CHKDSK | FIND /C "Errors  
found" > OUTPUT.BAT
```

However, when FIND /C acts on piped input, its output consists of *nothing* but the number of occurrences of the search string. If there were no errors, OUTPUT.BAT would contain just the character 0. If there were errors, it would contain 1. When OUTPUT.BAT executes, it will try to run a program called 0 or 1. Create files 0.BAT and 1.BAT to deal with these two possibilities.

Of course, you could simply run CHKDSK with the /F switch and let it attempt to fix any disk problems. But if you're managing a group of PCs whose users aren't DOS masters, you'll want to *know* about any problems. You'll want to study the results and perhaps eliminate the *cause* of the disk errors. It's easy enough to run CHKDSK again with the /F switch, after you've learned all you can from running it without the switch.

ROTATING BACKUPS

Here's how I handle backup chores on my PC using DOS batch files and the BACKUP utility. I keep two sets of diskettes and rotate the sets weekly. At the beginning of each

INCR.BAT

COMPLETE LISTING

```
@ECHO OFF  
ECHO Incremental backup  
CALL BACKSET.BAT  
ECHO Use most recent backup set: %lastset%  
PAUSE  
BACKUP C:\*.* A:/S/M  
IF NOT ERRORLEVEL 0 ECHO Incremental backup error  
SET lastset=  
SET nextset=
```



Figure 4: INCR.BAT makes an incremental backup on the same backup disk set that was used for the last FULL backup.

week, I run FULL.BAT (Figure 3) to do a full backup, using the least recent backup set. The rest of the week I run an incremental backup daily (more often, if needed) with INCR.BAT (Figure 4), using this same set of disks. And in case I forget, FULL.BAT and INCR.BAT always remind me which backup set to use.

Both batch files call BACKSET.BAT, which sets the environment variables *lastset* and *nextset* to indicate, respectively, the last (or most recent) backup set used and the next (or least recent) backup set to use. After each successful full backup, FULL.BAT rotates the backup sets by creating a new BACKSET.BAT and inserting new SET commands to reflect the rotation. Note that in the ECHO SET . . . command, there must not be any blanks before the >> redirection symbols.

Since the rotation takes place only if BACKUP completes successfully, you can run FULL.BAT again if the first attempt to back up fails for some reason. You can easily adapt FULL.BAT to handle any number of backup sets. For example, the com-

mands for four sets would look like this:

```
SET lastset=%nextset%  
SET nextset=error  
IF %lastset%==1/ SET nextset=2  
IF %lastset%==2/ SET nextset=3  
IF %lastset%==3/ SET nextset=4  
IF %lastset%==4/ SET nextset=1
```

For painless operation, you'd probably want to replace BACKUP with a more flexible utility such as *Fastback* or perhaps tape software commands.

Stephen Chow
Minneapolis, Minnesota



If the data you enter every day is really important, you may want to use *five* backup sets, one for each day. Now if your accounting data gets corrupted on Monday and you don't notice it until Thursday, you can go back to the previous Friday's backup and only have a few days' work to reenter.

Here are a few other ideas for backing up really important data. Keep at least one backup set off-site. For example, create *two* backup sets for Friday. Every Friday take one of them home, and bring the *other* one back on Monday. If something happens to all the backups at the office, you'll always have an off-site backup no more than a week old. Also, every month or quarter, retire one of your backup sets to a secure off-site location, perhaps a safety deposit box, and start a fresh set of disks in its place. Some data just can't be replaced!

SHARE YOUR SECRETS

Reveal your latest DOS and systems discovery through User-to-User; we'll pay you \$50 for any submission we print. Please submit your letter on a disk together with a printout. Mail your contribution to User-to-User, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for access instructions).

FULL.BAT

COMPLETE LISTING

```
@ECHO off  
ECHO Full backup  
CALL BACKSET.BAT  
ECHO Use least recent backup set: %nextset%  
PAUSE  
BACKUP C:\*.* A:/S  
IF NOT ERRORLEVEL 0 GOTO error  
REM rotate sets  
SET lastset=%nextset%  
SET nextset=error  
IF %lastset%==1/ SET nextset=2  
IF %lastset%==2/ SET nextset=1  
ECHO REM Set backup set number> backset.bat  
ECHO SET lastset=%lastset%>> backset.bat  
ECHO SET nextset=%nextset%>> backset.bat  
GOTO done  
:error  
ECHO Full backup error  
:done  
SET lastset=  
SET nextset=
```



Figure 3: This batch file prompts you for a backup disk set before making a full backup. Then it rotates the backup sets by creating a new BACKSET.BAT and inserting new SET commands.

by
Jeff Prosis

Tutor

ACCESSING YOUR FLOPPY DISK DRIVE

In the April 24, 1990, Tutor column, Jon Spencer wrote to you about a 1.2MB floppy drive that didn't recognize disk changes ("Floppy Disk Woes"). We recently encountered the same problem but fixed it by adding the following command

```
DRIVPARM=/D:0 /F:1
```

to CONFIG.SYS. Note that the /C switch has been omitted. This will force DOS to read the disk each time the disk is accessed rather than search its internal disk buffers.

Peter D. Williams
Seychelles (Indian Ocean)



This is a clever solution to the problem, and one that doesn't require any tinkering with the hardware. The DRIVPARM directive (available in MS-DOS 3.2 and later, but not in any version of PC-DOS) modifies the internal tables DOS maintains that define the characteristics of the floppy disk drives attached to the system.

The /D:0 switch designates that the A: drive is the one to be changed (use /D:1 for the B: drive), and /F:1 identifies it as a 1.2MB drive. The key here is that the /C switch, which says that the associated drive has a diskette change line, is omitted, fooling DOS into thinking that there is no change line. As a result, DOS defaults to physically accessing the drive each time a read is performed, effectively bypassing the nonoperable diskette change line. Good work!

DISTINGUISHING 386s AND 486s

No sooner had the July issue of *PC Magazine* hit the stands than readers began reporting (via PC MagNet) that the WHATCPU utility in the Tutor column was crashing 386 and 486 systems running QEMM-386, Version 5.0.

The problem was a direct result of WHATCPU's attempt to execute this pair

■ **ACCESSING YOUR FLOPPY DISK DRIVE:** Here's a simple way to make DOS bypass the floppy disk change line.

■ **DISTINGUISHING 386s AND 486s:** An updated WHATCPU.COM eliminates problems caused by the use of privileged instructions.

of privileged 386 instructions:

```
MOV CR0,EAX
MOV EAX,CR0
```

to access the CPU's CR0 register.

Privileged instructions are instructions that access key protected-mode registers and thus have the potential to affect the system as a whole, not just the process

that's executing them. Figure 1 lists the set of 386 instructions that fall into this category.

386s and 486s restrict the use of these instructions to processes executing with privilege level 0 in protected mode. Privilege level 0 is the highest level a process can have. It's usually reserved for the operating system itself, to preserve the integrity of the protected-mode operating model.

If a process running with a low privilege level, for example, could execute an HLT instruction, it could shut down the entire machine, stopping processes with higher privileges in their tracks.

Similarly, changing the contents of any of the descriptor table registers could affect the rest of the system.

The conflict with QEMM-386 arises because QEMM-386 runs DOS processes in Virtual 86 mode, and all Virtual 86 mode processes are run with privilege level 3—the lowest of the 386's four privilege levels. When the CPU encountered the instruction MOV CR0,EAX, it triggered an exception that notified QEMM-386 that

PC MAGAZINE PRIVILEGED 386 INSTRUCTIONS	
Instruction	Meaning
CLTS	Clear the TS (Task Switched) flag
HLT	Halt the CPU
LGDT	Load the Global Descriptor Table Register
LIDT	Load the Interrupt Descriptor Table Register
LLDT	Load the Local Descriptor Table Register
LMSW	Load Machine Status Word
LTR	Load the Task Register
MOV CRn, reg	Move data into a control register
MOV reg, CRn	Move data out of a control register
MOV DRn, reg	Move data into a debug register
MOV reg, DRn	Move data out of a debug register

Figure 1: The set of privileged instructions on the 386 is a subset of the larger 386 instruction set. To preserve the integrity of the system, the CPU generates an exception if a process running with a privilege level other than 0 executes one of these instructions.

Tutor

it had come across a privileged instruction that couldn't be executed. Interestingly enough, this problem did not show up with 386MAX, though that program also runs DOS processes in Virtual 86 mode. The reason: 386MAX fields the exception generated by the CPU and performs some fancy footwork to switch to privilege level 0 and back, allowing the application program to execute the privileged instructions and get on with business.

The solution was to find a way of differentiating between 386s and 486s without using privileged instructions. The result is WHATCPU2.COM, a revised version of our CPU-identification program that's compatible with 386 memory managers. The original code designed to separate 386s from 486s was replaced with the code fragment shown in Figure 2, on the recommendation of Intel engineers. This version tests the CPU's ability to retain data in bit 18 of the EFLAGS register, also known as the AC (Alignment Check) bit. This bit can't be toggled on a 386, because it isn't implemented in that chip. It can, however, be set or cleared on a 486, where it is used to enable or disable exceptions generated when memory locations are accessed on illegal boundaries. (For more information on the AC bit, see "Bringing It All Together: A Look

WHATCPU2.SCR

COMPLETE LISTING



```

A 0100
JMP 0123
DB 00,0A,"CPU is an 00506$206$306$406$","0D,0A,"$
MOV AH,09 ;Print opening message
MOV DX,0102
INT 21
MOV DX,0111 ;Test for 0000/0000
PUSH AX
POP AX
CMP SP,AX
JNS 0101 ;Branch if test positive
MOV DX,0114 ;Test for 206
PUSHF
POP AX
OR AX,4000
PUSH AX
POPF
PUSHF
POP AX
TEST AX,4000
JZ 0181 ;Branch if test positive
MOV DX,0118 ;Separate 386s from 486s
DB 66,0B,DC ;mov ebx,esp
DB 66,03,24,FC ;and esp,0FFFFFFFch
DB 66,9C ;pushfd
DB 66,50 ;pop eax
DB 66,0B,C8 ;mov ecx,eax
DB 66,35,00,0,04,00 ;xor eax,40000h
DB 66,50 ;push eax
DB 66,9D ;popfd
DB 66,9C ;pushfd
DB 66,50 ;pop eax
DB 66,25,00,00,04,00 ;and eax,40000h
DB 66,03,24,00,00,04,00 ;and ecx,40000h
DB 66,3B,C1 ;cmp eax,ecx
DB 0F,04,03,00 ;je 017A
DB BA,1C,01 ;mov dx,011C
DB 66,51 ;push ecx
DB 66,9D ;popfd
DB 66,0B,E3 ;mov esp,ebx
MOV AH,09 ;Print CPU type and exit
INT 21
MOV AH,09
MOV DX,0120
INT 21
RET

W WHATCPU2.COM
RCX
SD
W
0

```

Figure 3: This DEBUG script creates WHATCPU2.COM, an update of the utility for identifying CPU types.

Inside the 486 Chip" in the November 13, 1990, issue of *PC Magazine*.)

You can download WHATCPU2.COM, as well as its complete source code, from

PC MagNet. Or you can create the executable file yourself with the DEBUG script that is shown in Figure 3. The easy way to do it is to create an ASCII file with these commands, save it, and then type DEBUG <FILENAME.EXT to execute it. Note that the comments on the lines beginning with DB should not be typed in; they are included in the listing for reference purposes only. This method puts DEBUG's willingness to accept input from sources other than the keyboard to gainful use—and gives you a chance to check your listing for typos before running it.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. To have your question answered, write to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see the "By Modem" sidebar in the Utilities column). We're sorry, but we're unable to answer questions individually.

CODE TO SEPARATE 386s FROM 486s

```

.386
mov dx,offset cpu_386 ;Assume 386
mov ebx,esp ;Zero lower 2 bits of ESP
and esp,0FFFFFFFch ; to avoid AC fault on 486
pushfd ;Push EFLAGS register
pop eax ;EAX = EFLAGS
mov ecx,eax ;ECX = EFLAGS
xor eax,40000h ;Toggle AC bit (bit 18) in
; EFLAGS register
push eax ;Push new value
popfd ;Put it in EFLAGS
pushfd ;Push EFLAGS
pop eax ;EAX = EFLAGS
and eax,40000h ;Isolate bit 18 in EAX
and ecx,40000h ;Isolate bit 18 in ECX
cmp eax,ecx ;Are EAX and ECX equal?
je is_386 ;Yes, then it's a 386

mov dx,offset cpu_486 ;No, then it's a 486

is_386: push ecx ;Restore EFLAGS
popfd
mov esp,ebx ;Restore ESP
.
.
.

```

Figure 2: Here's the code that is used to determine whether a CPU is a 386 or a 486. The decision is based on the CPU's ability to retain data in bit 18 (the Alignment Check bit) of the EFLAGS register. On exit, the value in DX indicates what type of CPU the program detected.

PC Magazine's Direct Marketing Connection for PC Products and Services



Most of you buy PC products and services through direct marketing channels. In fact, in a recent study of subscribers, 83% said they bought PC products from direct marketers.*

You buy direct because you know exactly what you need and you seek good value and fast delivery.

The following special section connects you with the direct marketers who are eager to please you. By having them all in one place, you can quickly zero in on what you need and which vendor you want to call.



JUST FOR BUYERS WHO MEAN BUSINESS.

INTRODUCING SQUEEGEE.[™] THE AFFORDABLE GRAPHICS ACCELERATOR THAT MAKES WINDOWS PERFECTLY CLEAR.

You know the value of Windows 3.0. But Windows demands more performance and resolution than VGA provides. Enter Squeegee, from Spectragraphics. Squeegee is the graphic accelerator designed specifically to make Windows all it can be. With performance up to 15 times faster than super VGA. And resolution to make your Windows sparkle at any size. All at a price that's hard to pass up. Add one

Squeegee[™] for AT bus — \$595
Squeegee[™] for Microchannel[®] — \$695
1024 x 768 resolution, non-interlaced, 16 colors
256 color versions — additional \$250
High performance Windows and PM drivers
1 Year Limited Warranty
Call for competitive prices on
high-performance monitors



of our low-cost, high-resolution monitors and the advantages of doing Windows with Squeegee will become perfectly clear.



30 day no-risk guarantee. FREE end-user support line.

**Call 1-800
800-9599 \$595**

CIRCLE 171 ON READER SERVICE CARD

SPECTRAGRAPHICS

Squeegee[™] is a trademark of Spectragraphics, Inc.
Microchannel[®] is a trademark of the IBM Corporation

FastData Systems



\$1499 FastData 386/SX

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and want to rip through their favorite programs, like Lotus and WordPerfect at blinding speeds. This machine is ideal to run the latest memory demanding and graphic software, right out of the box. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit color VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel 80386-SX processor. (20mhz optional)
- ✓ 2 megabytes of zero wait-state RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive.
- ✓ (Second drive add \$79)
- ✓ Standard chassis with keylock, speed and reset buttons.
- ✓ (Optional chassis add \$50)
- ✓ Five available drive bays.
- ✓ 200 watt power supply
- ✓ 14" VGA color monitor with 16 bit VGA card with 256K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
Monochrome	\$1,499	\$1,579	\$1,699	\$1,819
VGA Color	\$1,599	\$1,679	\$1,799	\$1,919
VGA 1024	\$1,699	\$1,779	\$1,899	\$2,019



FastData 386/25 \$2099

The optimum combination of features, expandability, and power make the FastData 386/25 an ideal choice for those whose applications demand the most from a computer. Whether running as a network fileserver, CAD or graphics station, or power-user's workhorse, the FastData 386/25 handily meets the challenge. It comes configured with a whopping four megabytes of fast RAM, a superfast 22 millisecond 65 megabyte hard disk, and maximum VGA displaying 1024 by 768 resolution powered by a high-output 16 bit 512K VGA board. Plus, the FastMicro team will configure your FastData 386 exactly the way you want, without sending you shopping elsewhere. When evaluating 386-DX workstations, why even consider anything else?

Standard Features

- ✓ 25mhz Intel 80386-DX processor. (33mhz optional)
- ✓ 4 megabytes of zero wait-state RAM.
- ✓ 65 mb 22ms RLL hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive.
- ✓ (Second drive add \$79)
- ✓ Standard chassis with keylock, speed and reset buttons.
- ✓ Five available drive bays.
- ✓ 80387-DX coprocessor socket.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
- ✓ FCC Class B approved.

System Price	65mb	80mb	100mb	200mb
Monochrome	\$1,699	\$1,779	\$1,899	\$2,019
VGA Color	\$1,799	\$1,879	\$1,999	\$2,119
VGA 1024	\$1,899	\$1,979	\$2,099	\$2,219

Why FastData?

1. Superior Design.

We've been building PCs longer than most of the competition and we use proven designs that pass our stringent performance requirements and compatibility standards so it will be sure to pass yours.

2. Better Components

Standard equipment includes quality components from Western Digital, Keytronics, Toshiba, just to name a few. According to PC Magazine, "FastMicro includes some highly regarded peripherals."

3. Selection.

FastMicro offers thousands of hardware and software products to enhance your new personal computer. Computer Shopper said "FastMicro was chosen as the preferred source..." when its readers gave us a Best Buy award for 1990. In fact, our competition will probably tell you to call us when you need something to run on their PC.

4. Full Support.

Our team is standing by and ready to make your FastData computer perform to its greatest potential for a full refund of the purchase price.

You. When you buy a FastData computer, you're covered by Toll-Free technical support. And since we sell more software than other computer companies, we are uniquely qualified to give the better support.

5. Service.

All FastData personal computers come with a full one year warranty, but that's just the start. In the unlikely event your computer is down, it is our goal to get back up and working as quickly as possible - and we back it up with action. If our toll-free phone support or FastSHIP program can't solve your problem, we will service your FastData computer on-site to most U.S. locations or replace your computer at no charge.

6. Risk Free.

FastMicro sells to over half of the Fortune 500 and Universities in 47 states (we're working on the rest). These people buy for a living and rely on us, you can too. You can do more than take our word on it - purchase any FastData brand product from FastMicro and if you are not thoroughly satisfied after 30 days, you can return it for a full refund of the purchase price.

FASTMICRO

For information or to order call:

1-800-441-FAST

Hardware

DISK DRIVES

Colorado DJ-10 40-120mb Int. Tape	249
Conner (see IDE controllers below)	
CP3044 40mb IDE 28ms	269
CP3104 100mb IDE 25ms	499
CP3208 200mb IDE 25ms	849



Mitsubishi 60mb AT Kit

\$349 RLL encoding, 1:1 controller, and 22ms access time make this a quick performer. The perfect upgrade for your 286 or 386 compatible, this kit comes with everything you need including controller and cables.

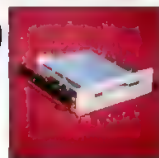
Micropolis	
MC1664 340mb ESDI 14ms	1395
Miniscribe 80mb IDE 19ms	479
Mitsubishi 60MB AT RLL MR535	269
NEC CDR-3501 External CD-ROM Drive	399

Plus Development

HardCard IXL 50 - 52mb 9 ms 16bit	399
HardCard IXL 105 - 105mb 9 ms 16bit	679
Impulse 42mb 12 ms 16bit IDE Kit	399
Impulse 105mb 9 ms 16bit IDE Kit	599

Toshiba 1.44mb Floppy Drive

Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add \$5.

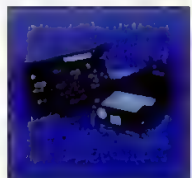


Seagate	
30MB XT Kit ST238 w/ cont.	249
40MB AT ST251-1 MFM Drive	239
40MB AT ST157A 28ms IDE Drive	249
80MB AT ST296N SCSI Drive w/adaptor	349
89MB ST1102A 19ms IDE Drive	419
125MB ST1144A 19ms IDE Drive	499
210MB ST1239A 15ms IDE Drive	799
330MB ST2383E 16ms ESDI Drive	1289

Tec	
720K 3.5" Floppy	59
1.2MB 5.25" Floppy	65
1.44MB 3.5" Floppy	65

Toshiba \$549 100mb IDE Kit

Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastMicro price. This kit comes with a fast 20ms 100mb drive and built-in 1:1 controller, 16 bit IDE card with dual floppy controller and cables, 5.25" brackets and rails. Call our experts for all your drive needs. Model MK234FC.



Toshiba	
360K 5.25" Floppy (Black)	69
1.2MB 5.25" Floppy	69
1.44MB 3.5" Floppy	69
65mb MK134 22ms RLL drive	279
100mb MK234FC IDE 3.5" drive	499
Western Digital Disk Controllers (also see FastData)	
WD 16 bit IDE Host - No Floppy/With Floppy	39/49
WD1006V-MM2 MFM AT 1:1 Controller	79
WD1006V-SR2 RLL AT 1:1 Controller	89
WE1007V-SE2 ESDI AT 1:1 Controller	149



Panasonic Super VGA

\$439 The Panasonic C1381 will do VGA up to 1024x768 interlaced resolution. It has a dot pitch of .28 and is compatible with all standard VGA cards. Includes swivel base and VGA cable.

BOARDS

Artisoft LanTastic	
LanTastic 2mbps Starter Kit - Two Station	369
LanTastic 2mbps Adaptor	169
LanTastic Ethernet Starter Kit - Two Station	499
LanTastic Ethernet Adaptor	239



ATI VGA Wonder+ \$189

New and improved, the ATI VGA WONDER+ is faster than VRAM. It does interlaced and non-interlaced 1024x768 modes, is 100% register compatible, and comes with extensive software drivers. A free mouse is included as an added bonus. 512K version 5219

ATI	
2400 ETC Internal	Call
2400 ETC External	187
9600/E External MNP V.42bis	479
VGA Basic 16	75
VGA Wonder + 256K	189
VGA Wonder + 512K	229
Brown Wagh Sound Blaster	149

Everex	
1200B Int Modem	55
2400B Int Modem	99
EGA 480 Card	79
RAM3000 16 bit RAM card	75
RAM8000 16 bit RAM card	169
Hercules Graphic Card +	169

Intel	
8087-2	115
287XL Faster than the 80287-10	199
387-DX20	369
387-SX16	319

Logitech	
ScanMan Plus	165
Scanman 256	289

Orchid	
ProDesigner II 512/1mb	279/329
Tiny Turbo 286	207
Tiny Turbo Xtra	267

Paradise	
Basic VGA - 8 bit	109
VGA 1024 256K/512K	175 199

Practical Modern \$449 9600SA

This external modem features V.42 and MNP error correction combined with MNP/PS and V.42 bis data compression to provide total high speed throughput. The PM9600SA is also V.32 TCM V.32, V.22 compliant and comes with a five year guarantee too



Practical Peripherals	
1200B Int Modem	59
2400B Int Modem	125
2400B Int with MNP	169
PM9600SA Ext. V.32/V.42bis	449

Prometheus	
Promodem 1200B Internal	48
Promodem 2400B Internal	98
Promodem 2400G External	149

Tiara Networking	
Lancard/A PC (Arcnet)	75
Lancard/E Star 8 (Ethernet)	139
Lancard/E AT (16 bit Ethernet)	249

USRobotics	
2400 Baud Internal	119
2400 Baud External	147
Courier HST 14,400 Ext.	579
Courier HST 14,400 Int.	539

Video 7	
VGA 1024i 256K	179
VGA 1024i 512K	209
Vega VGA	149
V-RAM VGA 512K	299

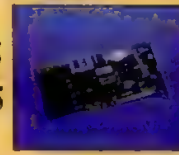
MONITORS

Mitsubishi	
1410 EGA	325
Diamond Scan 1381	479
NEC	
Multisync 2a	469
Multisync GS 2a	199
Multisync 3d	629
Multisync 4d	Call
Panasonic C1381 VGA	439
Princeton	Call
Seiko CM1440/1450	519 659
Sony 1304 Multiscan	669
Zenith 1492	Call

FastData Products

FastData 16 Bit VGA

The FastData 16bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.



FastData 16bit 1mb VGA	169
FastData CGA Card	35
FastData MGP Card	29

FastData 2400 Baud Internal Modem

\$69 The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with BitCom software.

9600B SendFax w/ 2400B Modem	99
MFM 16 Bit 1:1 Hard Floppy Disk Cont.	59
Parallel/Dual Serial/Game Card	29
RLL 16bit 1:1 Hard Floppy Disk Cont	69
XT 1.44 Dual Floppy Controller	35

FastData Monitors

Your best value, we have a complete line made for us by leading manufacturers like Samsung & Hyundai. Like all FastData products, you have a full 30 day money back guarantee. Shown is the VGA Color for \$279



FastData Monitors	
12" Amber Monochrome	79
14" Amber Monochrome	119
14" White Monochrome	119
14" White VGA Monochrome	129
14" CGA Color .52 dot pitch	199
14" VGA Color .39 dot pitch	279
14" VGA Color .31 dot pitch	319
14" Super VGA 1024 x 768 .28 dp.	349

PRINTERS

Canon BJ10E	319
BJ300	Call

Citizen GSX140

Loaded with features, this 24 pin printer is a hot seller! It comes with 6 resident fonts, paper parking, and Epson & IBM printing modes. It does up to 192 CPS and has a unique LCD control panel that lets you set everything without DIP switches. Upgrade to color anytime for just \$39.

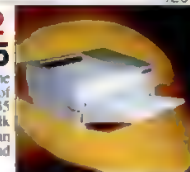


Citizen	
200GX	189
GSX140 / GSX145	285/Call
Diconix 150 Plus	329
FujitsuDL3400	359

NEC	
P3200	269
P3300	369
P6200	469
P6300	629

NEC Silentwriter 2 Model 90 \$1645

PC Magazine's editor's choice! The new NEC model 90 comes with 2mb of memory, Postscript by Adobe with 35 fonts, and parallel, serial and Appletalk interfaces. All this and 6 ppm speed, an easy-to-use LCD operator panel and letter, legal, & envelope feed.



OKIDATA	Call
Panasonic	
KXP1180	155
KXP1124	297
KXP1624	429
KXP4420 Laser	829
KXP4450/4455 Lasers	Call
Seiko Smart Label Printer	167
Star	
NX1001	149
NX1500	290
NX2410	249
XB2410 / 2415	429 569
Texas Instruments Microlaser PS35	1699

FastData 286/12 \$799

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Keytronic keyboard. And since it's a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive
- ✓ Standard chassis (shown with optional chassis - \$50)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ 287XL coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, and two serial ports.
- ✓ Keytronic enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ Full documentation.
- ✓ FCC Class B approved.



System Price	40mb	65mb	80mb	100mb
Monochrome	\$799	\$899	\$999	\$1,099
VGA Color	\$1,099	\$1,199	\$1,299	\$1,399
VGA 1024	\$1,399	\$1,499	\$1,599	\$1,699

Software



WINDOWS SOFTWARE

Adobe Illustrator	279
Adobe Type Manager	59
Ami	115
Ami Professional	287
Asymetrix Toolbook	279
Bistream Facilit	57
Corel Draw 2.0	339

Windows 3.0 \$89

The graphical user interface everyone is talking about! Turns your 286 or above with 640K or more of memory into a powerful multitasking workstation that runs even non-Windows applications. Plus, if you buy Windows now from FastMicro, we'll throw in 10 of the best Windows shareware programs

DBfast/Windows	239
Excel	299
Form Publisher	139
Grammatik IV for Windows	49
HDC First Apps	46
HDC Windows Express	46
Micrographix Draw +	149
Micrographix Designer	449
MicroPhone II	199
Microsoft Mouse w/ Windows 3.0	147
Microsoft Productivity Pack	39
Microsoft Windows Developer's Kit	309
Pagemaker	479
PerForm Pro	259
Powerpoint for Windows	309
Project for Windows	429
Publisher's Powerpak for Windows	45
Windows 3.0	89
Windows Entertainment Pack	27
WingZ Spreadsheet	309
Word for Windows	299

Serial Mouse with Windows \$99

This high-resolution serial mouse by Z-Nix is ergonomically designed and has adjustable resolution. This bundle includes Microsoft Windows 3.0 (5.25" disks only) and mouse software

ENTERTAINMENT & EDUCATION

Bannermania	21
Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
Hunt for Red October	19
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry II or III	35
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
Microsoft Learning DOS	32
NFL Challenge	55
PC Globe or PC USA	35
Sinicity	28
Tetris	19

FAST MICRO



TERMS: No Charge for Visa or MasterCard. All orders up to 20 pounds are shipped via Federal Express. Minimum order: \$50. Shipping & handling charge: 3% (Min. \$6). Product warranties, offers & claims are handled by the manufacturer*. Compatibility is not guaranteed*. No returns on used items. * Apparent returns are subject to 15% restocking fee. DOA's repaired or replaced at our option. Call for return authorization (RA) number first. Shipping is not refundable. Sorry, no COD's. Personal/company checks delay shipping. AK, HI, & APO addresses add \$15 per box. Prices/availability subject to change. Purchase orders accepted (no added surcharges) from approved corporations only. AZ orders add 6.7% tax. * Excludes FastData products.

Mailing Address:
3655 E. LaSalle St., Phoenix, AZ 85040
To place orders call: 800-441-3278
For customer service call: 602-437-0300

DATABASE & FORMS

askSam 5.0	209
Avery List & Mail Plus	37
Clarion Personal Developer	45
Clarion Professional Developer	449
Clipper 5.0	459
DataEase	489



Personal R:Base \$69

Who's says powerful relational databases are expensive. Not with the new easy-to-use Personal R:Base. It has intuitive pull-down menus that let you query your data, build quick forms and reports automatically and even build applications without complex programming

dBase III+	439
dBase IV	479
dBXL Diamond	129
Formbase	299
FormTool Gold	52
Formfiller	85
Formbase Plus	177
FoxPro	417
Paradox 3.5	489
Per:Form Designer & Filler	155
Personal Rbase	69
Q & A	214
RapidFile	99
Rbase for DOS	447
Reflex	159

DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	279
db Publisher Professional	389
GEM Desktop Pub	159
Pagemaker	479

Corel Draw Version 2.0 \$359

Winner of all the top awards, Corel Draw gives you more for your money. It supports the new Windows & includes incredible drawing and editing tools. Includes over 100 typefaces and 300 pieces of clipart. Corel Trace converts scanned art to smooth vector images in seconds. This is the most complete illustration package we've ever seen!



PFS:First Publisher	89
Printshop	33
Publisher's Paintbrush	149
Publish It!	135
Ventura Publisher Gold / Windows	519

386MAX 5.0	89
Address Book Plus Sr.	85
Calendar Creator Plus	37
Central Point Backup	59
Control Room	69
CoreFast	60
Carbon Copy Plus w/Host	105



DESQview 386 \$115

Bring multitasking to your 386! Includes DESQview, the award-winning multitasking environment. Also includes QEMM 386, the memory manager for 386 machines that makes DESQview screen and disk swapping even easier. Includes Manifest Memory Analyzer as an added bonus!

Desqview	68
Desqview 386	115
Direct Access	57
Disk Optimizer	37
DR DOS 5.0	109
GoScript Select/Plus	59/179

Central Point Backup \$59

The latest, most reliable and easiest to use backup is the same award-winning backup found in PC Tools Deluxe. It has a new user interface, scheduled backup capabilities, advanced error correction, compare features and much more. In addition to disks, it also supports most popular tape backup units.



FINANCIAL

Bedford Integrated Acct.	145
DAC Accounting 4.1	79
DAC Bonus Pack 4.1	119
DAC Payroll 4.1	57
Dollars & Sense	Call
Macintax 1040 for Windows	57

Peachtree Complete III \$139

A super value! Includes General Ledger, Accts. Payable, Accts. Receivable/Invoicing, Purchase Order, Payroll, Inventory, Job Cost, Fixed Assets and more. Loaded with over 450 reports, automatic backup and helpful manuals



Managing Your Money	113
Money Matters	49
One Write Plus G/L, A/P & A/R	159
Peachtree Complete III	139
Peachtree with Data Query	209
Quicken	36
Taxview 1040 Prof. for Windows	299
Turbo Tax Personal 1040	39
Turbo Tax Professional	209
Wealth Builder	129

GRAPHICS

Autosketch 3.0	139
Corel Draw 2.0	359
Design CADD 3-D	185
DrawPerfect	265
Freelance Plus	307
Genenc 3D Drafting	199
Genenc Cadd Level 2 Starter Kit	95
Genenc Cadd 5.0	Call
Harvard Graphics	289
PC Paintbrush IV Plus	109
Perspective Jr	69
PFS:First Graphics	89



Harvard Graphics \$289

The leading business graphics package, Harvard Graphics lets you create superior charts and graphs with ease. Plus, it comes with advanced drawing tools and symbol libraries, imports Lotus spreadsheets, and has advanced 3D features

INTEGRATED

First Choice	89
Framework XE	95
Geoworks Ensemble	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89

MICE/INPUT

Keytronics KB101 Keyboard	59
Keytronics Professional Mouse	59
Logitech HiRes C9 Serial	65
Logitech HiRes C9 Bus	76
Logitech Trackman Serial	75



Logitech C9 Serial Mouse \$65

Our best-selling mouse is now also. Comes with software to adjust the resolution just the way you want it and includes driver software and Pop-Up-Dos to make your computer hum at your fingertips. For PaintShop, add \$15

Logitech Serial w/Windows	127
Microsoft Serial or Bus Mouse only	83
Microsoft Serial or Bus w/ paint	95
Microsoft with Windows 3.0	147
Z-Nix Serial Mouse w/Windows 3.0	99

PROGRAMMING

Macro Assembler	89
Microsoft C Compiler	303
Turbo C++	129
Turbo C++ Professional	189
Turbo Pascal	90
Quick Basic	60
Quick C	60
Quick Pascal	60

SPREADSHEETS

Allways	106
Excel	309
Lotus 1-2-3 version 2.2	325
Lotus 1-2-3 version 3.1	399

Lotus 1-2-3 Version 2.2 \$325

The standard for spreadsheets, Lotus 1-2-3 version 2.2 is faster and more powerful than previous versions that made it famous. Includes add-in manager and more functions for greater flexibility. Also comes with Allways for great presentations made easy

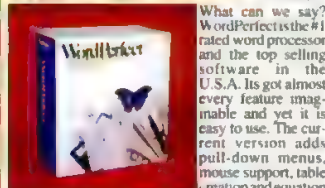


Lucid 3-D	53
Quattro Pro (call for details)	89
Supercalc 5D	289

WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik IV	49
LetterPerfect	119
Multimate 4.0	267
Professional Write	149
Rightwriter	58
Sprint	117

WordPerfect 5.1 \$239



What can we say? WordPerfect is the #1 rated word processor and the top selling software in the U.S.A. Its got almost every feature imaginable and yet it is easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!

Word	209
Word for Windows	309
Word Perfect 5.1	239
Word Perfect Add'l Station	153
Word Perfect Office	79
WordStar Professional	Call

Call On Non-Listed Items

Guaranteed Lowest Prices

MEMORY

Finally,
the memory
upgrade you've
been looking for.

Look at our prices.

Hard Drives International offers the best values in the industry on memory. In fact, if you find one of our products at a lower price anywhere in this magazine, we'll beat that price. The lowest prices on memory upgrades. Guaranteed.

Look at our quality.

Nothing beats Legend for quality and reliability. Legend upgrades meet original manufacturer specifications, and have one of the lowest failure rates out there. Legend- the first name in memory.

Look at our service.

Our experienced salespeople will get you the right upgrade. And, if for any reason you're not satisfied within 30 days of purchase, send it back. It's that simple. Hard Drives International is your memory expert. And with Legend's five year warranty, you'll be sure to make a no-hassle purchase.



1912 W. 4th St., Tempe, AZ 85281
Dept. CE
602-150-1128 FAX 602-829-9193
Another Insight Company



Hard Drives International
presents quality



MEMORY UPGRADES

SIMMS 1x9 80ns \$55

SIMMS & SIPPS

256Kb x8	80ns	\$19	256Kb x9	80ns	\$19
1Mb x8	80ns	\$49	1Mb x9	80ns	\$55
4Mb x8	80ns	\$299	4Mb x9	80ns	\$319

2 to 8Mb 16 bit Expansion Board

IBM compatible 286 & 386 extended & expanded (2Mb installed). Uses DIPP memory modules. **\$209**

Hewlett Packard Laser Printer

1Mb for \$99 2Mb for \$149 4Mb for \$259

4Mb Compaq 386 Expansion Board \$359

2Mb IBM PS/2 Model 70 \$134

HARD DRIVES
International

Order Status: 800-729-4490
International: 602-350-1144 FAX: 602-921-8312
PO's • Gov't: 800-733-0882 FAX: 602-350-1180
APO/FPO: 602-350-1145

Look at our selection.

We have memory for any system. Whether it's a standard 286 or 386 computer, a Toshiba Laptop, or a Hewlett Packard Printer, we've got it covered. Give us a call. We'll meet all of your memory demands.

Look at our easy installation.

You don't have to be an electronic wiz to install Legend. A step-by-step guide makes installation a snap. And, if things don't come out exactly right, our award-winning technical support staff will be glad to help you--toll-free.



Never a surcharge for VISA and MC!

To order call:

800-488-0002

Incredible Selection! We also memory for: Acer, Apple, Apollo, AST, AT&T, Canon, Compaq, DEC, Dell, Epson, Eyetex, Hewlett Packard, IBM, Intel, Samsung, Silicon Graphics, Sun Micro Systems, Toshiba, Wyse, Zenith. A more

"YOUR SOFTWARE SPECIALISTS"

TO ORDER CALL TOLL FREE

1-800-822-8088

★ CALL FOR OUR FREE CATALOG ★

"GIVE US THE OPPORTUNITY TO BEAT ANY ADVERTISED PRICE"

**SOFTWARE
ADD-ONS**

★ SUPER SPECIALS ★

INSTANT RECALL ... \$ 75

PC ANYWHERE IV .. \$ 95

DAC EASY NETWORK ... \$289

ACCOUNTING

Accpac Bedford Accounting	\$ 145
Accpac BPI/GA, A/R, A/P, I/C	\$ 229
Accpac Easy G/A, Payroll ea.	\$ 519
Accpac Plus G/L, A/R, A/P, Payroll ea.	\$ 519
Accpac Plus I/C, O/E, R/I, J/C ea.	\$ 519
Accpac Plus Windowing Mgr	\$ 199
Businessworks Bundle	\$ 499
DAC Easy Accounting/Payroll 4.1	\$ 779.95
DAC Easy Bonus Pak 4.1	\$ 189
DAC Easy Network	\$ 289
MicroBiz Retail Store Controller	\$ 399
One Write Plus Accounting System	\$ 199
Pacioli 2000	\$ 39
Peachtree Complete III Accounting	\$ 142
Peachtree w/Data Query III	\$ 209
Solomon Profitwise Acctg. (10-Pak)	\$ 299
Timeslips III	\$ 199
Timeslips LAN	\$ 499

C.A.D.

Autocad v. 11	\$ 2999
Autosketch 3.0	\$ 149
DesignCAD 3D	\$ 199
Design CAD 4.2	\$ 199
Drafix CAD Ultra	\$ 235
Generic 3D Drafting	\$ 229
Generic CADD 5.0	\$ 219
Generic CADD Starter Kit	\$ 119
Mathcad 2.5	\$ 89
Mathcad-Advanced Math Pak	\$ 73
Turbo CAD	\$ 73

COMMUNICATIONS

Brooklyn Bridge 3.0	\$ 79
Carbon Copy Plus	\$ 109
Close-Up Customer	\$ 119
Close-Up Support	\$ 119
CoSession 2-user	\$ 149
Crosstalk For Windows	\$ 119
Crosstalk Mark IV	\$ 127
Lap Link III	\$ 89
Mirror III	\$ 79
PC Anywhere III	\$ 99
PC Anywhere IV	\$ 99
PC Anywhere IV LAN	\$ 299
Procom Plus	\$ 299
Relay Gold	\$ 199
Smartcom III	\$ 139
Smarterm 240	\$ 187
Smarterm 320	\$ 109
Smarterm 400	\$ 97

DATABASE

Advanced Revelation	\$ 499
Alpha IV	\$ 299
AsxSam 4.2	\$ 159
Clipper 5.0	\$ 479
Database 4.2	\$ 429
Data Flex	\$ 799
Data Flex (Multiuser)	\$ 799
Database	\$ 259
dBase III Plus	\$ 429
dBase IV 1.1	\$ 499
dBase IV Developer's Kit 1.1	\$ 799
dBase IV LAN	\$ 139
dBase XL Diamond	\$ 279
Filebase Plus 2.1 LAN	\$ 285
Filebase Plus 2.1-SU runtime	\$ 285
Filebase 2.1 - Single User	\$ 182
Filebase Plus 386	\$ 279
Filebase Plus LAN Runtime	\$ 427
Fox Pro	\$ 499
Fox Pro LAN	\$ 299
Fox Pro Runtime	\$ 299
Informix 4GL Compiled	\$ 679
Informix 4GL Compiled Runtime	\$ 499
Informix SQL	\$ 179
Informix SQL Runtime	\$ 299
IZE	\$ 999
Oracle Professional	\$ 999
Paradox 3.5	\$ 99
PC File 5.0	\$ 99
PC File LAN	\$ 299
PC Focus	\$ 999
PFS Professional File	\$ 182
Q & A 3.0	\$ 219
QuickSilver Diamond	\$ 325
R & R Clipper/Foxbase Module	\$ 49
RAR Code Generator	\$ 99
RAR Reportwriter (dBase)	\$ 99
RBase for DOS 3.1	\$ 429
Reflex 2.0	\$ 189
UI Programmer 2.1	\$ 339

DESKTOP PUBLISHING

Adobe Illustrator Windows	\$ 279
Express Publisher	\$ 97
First Publisher 3.0	\$ 97
Freedom of the Press	\$ 299
GEM Desktop Publisher	\$ 169
Newsmaster II	\$ 43
Newsroom Pro	\$ 299
OmniPage 286	\$ 599
OmniPage 386	\$ 599
Pagemaker 3.01	\$ 147
Publish-It	\$ 99
Publishers Paintbrush	\$ 139
Publishers Power Pack/P or Word	\$ 99
Publisher's Type Foundry	\$ 299
Ventura Gold For DOS	\$ 619
VP Toolbox Adv. For Ventura	\$ 107

FINANCE

Managing Your Money 6.0	\$ 112
Market Analyzer Plus	\$ 329

Market Mgr. Plus Professional	\$ 329
Money Counts	\$ 39
Quicklan 4.0	\$ 299
Turbo Tax Pro Series	\$ 299

GRAPHICS

Apollous II	\$ 219
Graph-In-The-Box	\$ 79
Graph-In-The-Box Executive	\$ 159
Graphics Link Plus	\$ 109
Harvard Graphics 2.3	\$ 139
Harvard Graphics LAN (5u)	\$ 239
Micrografix Charisma	\$ 235
Statgraphics 4.0	\$ 579
Statist w/Signy 5.0	\$ 789

INTEGRATED

Alpha Works	\$ 119
Enable OA	\$ 415
First Choice	\$ 97
Lotus Symphony 2.2	\$ 489
Quattro	\$ 99
Microsoft Works	\$ 99
Smartware II	\$ 449

MICE

DFI Color Scanner (HS-4000)	\$ 599
IMSI Mouse	\$ 45
Kearington Expert Mouse PC	\$ 102
Kraft Trackball	\$ 99
Logitech Mire Mouse-bus	\$ 85
Logitech Mire Mouse-senal	\$ 85
Logitech Mouse w/Paintshow	\$ 135
Logitech Mouse (Serial) Windows 3.0	\$ 129
Logitech Scanman Plus	\$ 85
Logitech Trackman	\$ 85
Microsoft Mouse	\$ 99
Microsoft Mouse w/Paintbrush	\$ 147
Microsoft Mouse w/Windows 3.0	\$ 99
PC Mouse II w/Paint	\$ 99
PC Trackball (serial)	\$ 99

NETWORKING

Desklink 2.2	\$ 92
Lantronic Ethernet Starter	\$ 445
Lantronic Starter Kit	\$ 389
Microsoft LAN Mgr. Server	\$ 799
Microsoft SQL Server	\$ 799
Novell Adv. Network 286	\$ 2149
Novell Adv. Network 386	\$ 2179
Novell ELS I	\$ 519
Novell ELS II	\$ 1229

OS/2

MS OS/2 Presentation Mgr. Tiki	\$ 349
Pagemaker for OS/2	\$ 499
Paradox OS/2	\$ 499
PC Focus for OS/2	\$ 899
PM Excel for OS/2	\$ 899
Workperfect 5.0 for OS/2	\$ 329

PROGRAMMING

APL Plus/PC 9.1	\$ 489
Brief Editor	\$ 489
Brief dBase	\$ 279
Clarion Personal Developer 2.0	\$ 45
Clarion Professional Developer 2.1	\$ 105
Edi	\$ 105
Lattice C Compiler	\$ 185
Matrix Layout	\$ 139
Microsoft Basic PDS 7.1	\$ 299
Microsoft C Compiler 6.0	\$ 299
Microsoft Cobol Compiler	\$ 272
Microsoft Fortran 5.0	\$ 99
Microsoft Macro Assembler 5.1	\$ 99
Microsoft Quick C	\$ 99
Microsoft Quick Pascal	\$ 99
Microsoft Quickbasic 4.5	\$ 99
MS Quick C/Assembler	\$ 129
MS Windows Development Kit 3.0	\$ 309
Paradox Engine (for C)	\$ 389
PLink 86 +	\$ 399
Powerbasic	\$ 79
RM Cobol 86	\$ 799
SPF/PC	\$ 145
Turbo C Debugger	\$ 99
Turbo C + Professional	\$ 119
Turbo C 2.0	\$ 179
Turbo C Tools	\$ 129
Turbo Pascal 6.0	\$ 99
Turbo Pascal Pro	\$ 159

PAINTING

Animator	\$ 225
Arts & Letters Graphics Editor	\$ 449
Calendar Creator plus	\$ 39
Corel Draw	\$ 399
Deluxe Paint II Enhanced	\$ 77
Designer 3.0	\$ 435
Dr. Halo III	\$ 29
Draw Perfect	\$ 289
Flowcharting III	\$ 139
Formfiller	\$ 79
Formtool Gold	\$ 79
Formwork w/ill n' file	\$ 159
GEM/3 Draw Plus	\$ 119
Grasp	\$ 309
IBM Storyboard Plus	\$ 299
Lotus FreelancePlus	\$ 309
Org Plus Advanced	\$ 72
PC Globe	\$ 45
PC Paintbrush IV Plus	\$ 105
PC Paintbrush Plus	\$ 249
PerForm	\$ 154

Pizzaz Plus	\$ 79
Printmaster Plus	\$ 33
Printshop	\$ 35
Softtype	\$ 109
Xerox Formbase	\$ 295

PROJECT MANAGEMENT

Harvard Project Manager 3.0	\$ 429
Project Scheduler IV	\$ 489
Project Workbench Advanced	\$ 699
Superproject Expert	\$ 399
Timeline 4.0	\$ 399
Timeline 4.0 LAN Pak	\$ 199

SPREADSHEETS

Lotus 1-2-3 2.2	\$ 329
Lotus 1-2-3 2 Server	\$ 995
Lotus 1-2-3 3.1	\$ 329
Lotus 1-2-3 3.1 Server	\$ 699
LUCID 3D	\$ 83
Microsoft Excel	\$ 297
Microsoft Multiplan	\$ 119
Quattro	\$ 29
Quattro Pro 2.0	\$ 299
Quattro Pro LAN Pak	\$ 199
R&R Worksheet Reportwriter	\$ 109
Supercalc V	\$ 289
Twin Advanced	\$ 59

UTILITIES

@ Base	\$ 119
@ Liberty	\$ 119
86-to-the-Max 5.0	\$ 79
Above Disc Plus	\$ 67
Act I	\$ 215
Allways 1.2	\$ 105
Automenu	\$ 42
Battery Watch 2.0	\$ 29
Catchword	\$ 139
Check-It	\$ 79
Concurrent DOS 386 (10u)	\$ 329
Control Room	\$ 79
Copy II PC	\$ 105
Copy II PC Deluxe Option Board	\$ 55
Corporate Ladder	\$ 35
Cruise Control	\$ 159
Dan Brinklin's Demo II	\$ 59
Dan Brinklin's Page Garden	\$ 49
Designview	\$ 129
Designview 386	\$ 87
Direct Access 5.0	\$ 149
Direct Net	\$ 89
Disk Manager	\$ 89
Disk Optimizer	\$ 89
Disk Technician Advanced	\$ 39
Diskette Manager III	\$ 159
D.R. DOS 5.0	\$ 107
FAST I	\$ 49
Fastback Plus	\$ 43
Fastpak Mail	\$ 43
Fastrax	\$ 43
Flight Simulator 4.0	\$ 87
Go-Script 3.0	\$ 175
Go-Script Plus 3.0	\$ 79
Goler	\$ 65
H/Text H/Formal H/Optimum 3.0	\$ 129
HDC Windows Express	\$ 65
Headroom	\$ 65
Hi-Jack	\$ 49
Hyperpad	\$ 65
Impress	\$ 65
InfoSelect	\$ 75
Instant Recall	\$ 285
Ko-Pilot	\$ 285
Label Pro	\$ 49
Labels Unlimited	\$ 49
Le Menu	\$ 299
Lotus Agenda	\$ 97
Lotus Magellan 2.0	\$ 65
Mace 1990	\$ 65
Mace Utilities 5.0	\$ 65
Mace Vaccine	\$ 39
Mavis Beacon Teaches Typing	\$ 39
Memory Mate	\$ 39
Microsoft DOS 3.3 w/GWBasic	\$ 79
Microsoft DOS 3.01 w/GWBasic	\$ 79
Microsoft Learning DOS	\$ 107
Microsoft Windows 3.0	\$ 97
Norton Advanced Utilities 5.0	\$ 97
Norton Backup	\$ 97
Norton Commander 3.0	\$ 97
Norton Editor	\$ 97
Options	\$ 45
OS/2 Extended	\$ 449
OS/2 Standard	\$ 279
Pathfinder 4.11	\$ 47
Pathfinder Plus	\$ 82
PC Tools Deluxe 6.0	\$ 199
PC-MOS 386	\$ 55
PC-MOS 386 (5-user)	\$ 77
Pop-Drop Plus	\$ 47
Power Panel	\$ 69
Print-Q 4.0	\$ 69

TO ORDER BY FAX:

215-639-7234

For Products not Listed call:

215-639-7110

Please send all correspondence to

Software Add-Ons

Two Greenwood Square

3331 Street Rd., Suite #155

Bensalem, PA 19020



Prices, terms, and availability subject to change without notice

Policies:

1 - We accept VISA, Mastercard & Discover - No Surcharge

2 - U.S. Shipping - any item - \$5

- any 2 items - \$7

- 3 or more add 2%

3 - COD Charge of \$5 per order

4 - Purchase Orders must be approved

5 - International Orders welcome (except Canada)

6 - DEALERS & VAR INQUIRIES WELCOME

7 - Returns are subject to approval - 10% restocking fee

CUSTOMERS

9/9/90 M.F.

10/9/90 Sat

386DX-20 VGA

120MB HD

\$2,999

- Intel 386 20MHz 32-Bit CPU
- 2MB RAM Expandable to 8MB
- Conner 120MB HD, 40MB Option
- 640x480 LCD VGA Display
- Removable Keyboard
- Weights 14lbs w/battery
- 20MHz 80387 Option
- Built-In Modem Slot
- External Expansion Box
- Internal 3.5" 1.44MB FD
- External Floppy Disk Option
- External VGA Display
- 34.6 Watt-Hr NiCad Battery
- External Keyboard Connector
- 13.7"Wx8.5"Dx4.3"H

386SX VGA

120MB HD

386SX VGA

80MB HD

\$2,499

\$2,699

- Intel 80386SX CPU
- 2MB RAM to 6MB
- 80MB HD, 40MB Option
- 640x480 LCD VGA
- Weights 11.3lbs w/bat
- Internal Fax/Modem Slot
- Internal 3.5" 1.44MB FD
- External Floppy Disk
- External VGA Display
- 12.6"Wx12.4"Dx2.36"H

- Intel 80386SX CPU
- 1MB RAM Standard
- Conner 120MB, 40MB Opt
- 10.5" LCD VGA 32 Gray
- Removable Keyboard
- Weights 12lbs w/bat
- Built-In Modem Slot
- External Expansion
- Internal 3.5" 1.44MB
- External VGA Display
- 13"Wx9.6"Dx3.3"H

**30-DAY
MONEY BACK
1-Year TRW On-Site**

Trumbull Post
COMPUTER SYSTEMS, INC.

Including Canada and NY state

In New York City Call: 212-627-4485

FAX Orders Dial: 212-627-9884

Tech Help Call: 212-627-9573

Frankfurt, Germany: 49-69-418027

APO, FPO, OEMs, Co./Univ. POs

Open Monday through Saturday

MasterCard, VISA and C.O.D., No Surcharges

135 West 26th St., 8th Floor

New York, New York 10001

CIRCLE 273 ON READER SERVICE CARD



READER SERVICE CARD

FREE INFORMATION

IT'S AS EASY
AS 1, 2, 31. Fill in your name and address and check
off your answers to the nine research
questions.2. Circle the numbers on the card that correspond
to the ads or articles you'd like more informa-
tion about.3. The literature will be mailed to you from
the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Valid after May 31, 1991

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191																																																																																																																																					
192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295																																																																																	
296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451																													
452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555																																																																																	
556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711																													
712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815																																																																																	
816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000

1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No2. Please indicate your company or organization's
primary business activity: (Check one only)

01. ☐ Manufacturer of Computer Equipment,
Computers, Software
02. ☐ Manufacturer—Aerospace
03. ☐ Manufacturer—Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/MSD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/
Accounting
09. ☐ Education
10. ☐ Government—Federal
11. ☐ Government—Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture
16. ☐ Agriculture/Construction/Mining/Oil/
Transportation/Utilities

17. ☐ Non-Computer Retailer/Distributor
18. ☐ Other Business or Service
99. ☐ Other3. Please indicate your primary business
function: (Check one only)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
99. ☐ Other

4. Is your company a reseller?
01. ☐ Yes
02. ☐ No5. For how many IBM PCs and
compatibles do you specify brands
of products:

01. ☐ 10 or less
02. ☐ 11-25
03. ☐ 26-99
04. ☐ 100 or more

6. Are there any PCs in your office?

- (Check all that apply)
01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment
currently installed at your location:
(Check all that apply)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh

8. Do you plan to buy any PC Products?
01. ☐ Now
02. ☐ In 4 to 6 months
03. ☐ In 7 to 12 months
04. ☐ No definite plans
Please print.

05. ☐ 1000 or more

Name _____

Title _____ Phone (____) _____

Company _____

Address _____

City _____ State _____ Zip _____

Signature _____ Date _____

☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.

PC 2/26-6



READER SERVICE CARD

FREE INFORMATION

IT'S AS EASY
AS 1, 2, 31. Fill in your name and address and check
off your answers to the nine research
questions.2. Circle the numbers on the card that correspond
to the ads or articles you'd like more informa-
tion about.3. The literature will be mailed to you from
the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Valid after May 31, 1991

140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191																																																																																																								
192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295																																																				
296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451
452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	49																																																																																																														



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



PO BOX 1687
RIVERTON NJ 08077-9687



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



PO BOX 1687
RIVERTON NJ 08077-9687



CompuAdd's Lowest

\$495

CompuAdd 810 Features:

- NEC V20 microprocessor rated at 10MHz (4.77 MHz, 7.15MHz, and 9.54MHz)
- 640KB dynamic RAM
- Built-in dual diskette drive controller dual IDE hard drive interface two serial ports (one 9-pin; one 25-pin) game port interface (cable required)
- 5.25" 360KB diskette drive
- Piezoelectric sound generator
- 8087 math coprocessor socket
- Real-time clock socket
- Five-slot riser assembly allows easy access to three full-size and two half-size XT expansion slots
- 101-key enhanced keyboard
- Supports monochrome, CGA, EGA, or VGA video
- System Utilities and Diagnostics Diskette
- **810 Base System Price: \$495 (64700)**
Lease as low as \$20/month

Optional: MGA, CGA or VGA monitor and adapter 20MB or 40MB hard drive, fax, modem and other accessory boards, mouse, joystick or other input devices

810 Monitor and Hard Drive Options

	MGA	CVG	CVGA
No Hard Drive	64701 - \$590	64706 - \$730	64711 - \$940
20MB	64702 - \$865	64707 - \$1005	64712 - \$1215
40MB	64703 - \$955	64708 - \$1095	64713 - \$1305



Call Today

for a FREE CompuAdd color catalog with incredible values on hundreds of other PC products.

The CompuAdd 810 is entry-level priced — as low as \$495 — so that even a student can afford it! Yet this XT-compatible machine is powerful enough for working-world tasks!

The reliable, high-performance NEC V20 microprocessor makes the CompuAdd 810 the perfect choice for doing homework assignments or computerizing an office on a tight budget. The 810 comes fully loaded with 640KB RAM so you can handle the most popular applications,

from word processing to spreadsheets to games.

The CompuAdd 810 works with equal efficiency as a standalone PC or as a networked workstation. Without spending a lot of money, you can set up additional accounting and word processing stations, expand your office network or use the 810 as part of a fax system. At this incred-

ible CompuAdd value, you can add a PC at home for those occasional after-hours work sessions.



 **Call 800-456-3660**

 800-387-3266  95-800-010-0401  0800-373535  0130-6009  140-364-675

Prices Ever! Hurry!

\$695

Functionality, versatility and practicality — plus one of the best computer values anywhere — that's what you get in the AT-compatible CompuAdd 212.

Dependable 80286-based systems are still the workhorses of most office computer installations. The CompuAdd 212 continues to be one of our best selling computers — as low as \$695!

Thousands of proven and useful software programs have been written for AT-compatible computers. You can choose from the most popular word processing, spreadsheet, database, graphics and project management software.

Powered by an 80286 processor running at 12.5MHz, the economically-priced CompuAdd 212 plows

through the toughest projects with speed and efficiency. It comes with 512KB RAM, expandable to 4MB on the motherboard. That means you can

run sophisticated MS-DOS, OS/2, SCO™ XENIX and Novell applications. Or use the CompuAdd 212 as a dependable, high-performance workstation on your office network.

Get your hands on two of the best computer values you'll find anywhere — the XT-compatible CompuAdd 810 and the AT-

compatible CompuAdd 212. Visit one of the 89 CompuAdd Superstores — call today for the location of one near you! Or call today — toll free — and ask for a FREE copy of CompuAdd's color catalog with hundreds of PC products.



CompuAdd 212 Features:

- 80286 microprocessor rated at 12MHz (7MHz, 12MHz)
- Built in dual diskette drive controller dual IDE hard drive interface parallel port game port interface (cable required)
- Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- 80287 (10MHz) math coprocessor socket
- Real-time clock/calendar
- Five-slot riser assembly allows easy access to three full-size 16-bit and two half-size 8-bit expansion slots
- 512KB DRAM, expandable to 4MB on the motherboard, using 1MB SIMMs
- 101-key enhanced keyboard
- Supports monochrome, CGA, EGA or VGA video
- 212 Base System Price: \$695 (64730)
Lease as low as \$28/month

Optional: MGA, CGA or VGA monitor and adapter 20MB or 40MB hard drive 1MB SIMMs for memory upgrades, fax, modem and other accessory boards, mouse, joystick or other input devices

212 Monitor and Hard Drive Options

	MGA	CVGA
40MB (28ms)	64732 - \$1259	64742 - \$1569
80MB (19ms)	64733 - \$1529	64743 - \$1839

We accept MasterCard, VISA, money orders, certified checks and personal checks (please allow ten days for processing). (U.S.) \$50 minimum order; company and institutional purchase orders (minimum initial purchase \$500; thereafter \$50), and wire transfers. Please add 2% to all purchases for shipping and handling (minimum \$3; shipping outside the continental United States will increase cost). Add 8% for shipping and handling to 41C/PTPO addresses (minimum \$10). Please add appropriate state sales tax. Three-day money-back guarantee does not include return freight or shipping and handling. Upgraded software, videotapes, other consumables and shipping costs are nonrefundable. All return items must be accompanied by a return merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors. Call 800-456-3660 for a copy of CompuAdd's complete catalog.

CompuAdd

Customer driven, by design.™

Call 800-456-3660

Hours: Monday - Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology, Austin, Texas 78727

Key Code 815

Fax: 512-335-6236
Tech Support: 800-999-9901
Outside US: 512-258-5575

LAPTOP COMPUTERS

SPECIAL PRICING ON ALL LAPTOPS

TOSHIBA	ALL MODELS	SPECIAL
NEC	PROSPEED ALL MODELS	SPECIAL
COMPAQ	LTE286/40	2775
COMPAQ	SLT386/120MB VGA	5289
SHARP	PC6220 286/VGA/20MB	SPECIAL
PACKARD BELL	PB286NB 20MB VGA	SPECIAL
TEXAS INSTRUMENT	TM2000/TM3000	SPECIAL

COMPUTERS

COMPAQ	ALL MODELS	CALL
PACKARD BELL	ALL MODELS	CALL
AST	286/386/486 ALL MODELS	CALL
WYSE TERMINALS	30/50/60	294/375/298
DTK	8086/286/386/486	CALL FOR CUSTOM QUOTES

DISC DRIVES / TAPE BACKUP

COLORADO DJ-10	40-120MB INT TAPE DRIVE	249
COLORADO DJ-20	120-250MB INT TAPE DRIVE	349
MOUNTAIN	40meg int/ext	249/CALL
MAYNARD	40/60/150MB INT/EXT	CALL
MICROPOLIS	1654-7 161MB ESDI 16 ms	849
MICROPOLIS	1664-7 345MB ESDI 14ms	1369
MAXTOR LXT200A	206MB IDE 3.5" 15ms	799
SEAGATE	ST251-1 40MB MFM 5 25" 28ms	242
SEAGATE	ST157A 40MB IDE 3.5" 28ms	245
SEAGATE	ST1102A 88MB IDE 3 5" 19ms	465
SEAGATE	ST1144A 124MB IDE 3.5" 19ms	489
CONNOR ALL MODELS		CALL
TOSHIBA	1.44MB Floppy 3 5"	79
PLUS HARD CARD II XL		NEW

MATH CO-PROCESSORS

INTEL	80287XL	189
INTEL	80387SX	288
INTEL	80387-16	319
INTEL	80387-20	359
INTEL	80387-25	449
INTEL	80387-33	559
CYRIX	80387-20	309
CYRIX	80387-25	389
CYRIX	80387-33	475
WEITEK	ALL MODELS	CALL

FAX MACHINES

SHARP	FO230 /FO333	579/699
MURATA	M1100/M1850	539/775
PANASONIC	PANAFAX MODELS	CALL
CANON	FAXPHONE 23	769
EPSON	FAX 1000 W/paper cutter	435

PACKARD BELL FORCE 1

- 286 12MHz 1MB-RAM
- Includes Color VGA monitor
- 5.25" & 3.5" floppies
- 40MB hard drive
- Lotus Works software
- MS-DOS 4.01 & GW-Basic
- 1-Year On-Site Warranty

\$1389

FEBRUARY SPECIALS

NEC SILENTWRITER 2 MODEL 90

- PC Magazines Editor's Choice
- Adobe Postscript & HP emulation
- 2M RAM (expandable to 4MB)
- 35 built-in Postscript fonts
- Parallel, serial & Appletalk

\$1589

TEXAS INSTRUMENTS TRAVELMATE 3000

- 80386SX 20MHz processor
- Ultra slim 8.5x11x1.8 inches
- Weighs 5.7 lbs. w/batt
- 640x480 VGA white display
- 20MB or 40MB drive, 1MB-RAM
- Internal 3.5" floppy

NOW IN STOCK!

MONITORS

NEC GS2A	14" mono VGA	205
NEC IIA	14" 800x600	465
NEC 3D	14" 1024x768	609
NEC 4D	16" multisync 1024x768	BEST
NEC 5D	20" multisync 1280x1024	PRICE
PACK BELL PB8529VG	14" VGA 640x480 .31mm	339
PACK BELL PB8541VG	14" VGA 640x480 .41mm	295
GOLDSTAR	ALL MODELS	CALL
MITSUBISHI	ALL MODELS	CALL
ZENITH 1492	14" VGA flat 640x480	592
PRINCETON..ULTRA-1400/ULTRA-1600	1024x768	CALL
SAMSUNG	MULTISYNC 14" 800x600	439
SEIKO	1440/1450 14" VGA .25mm	515/659
PANASONIC	PANASYNC 1381 1024x768	CALL
SONY	CPD-1304 14" 1024x768 .25mm	649

VIDEO BOARDS

ATI VGA WONDER+ w/mouse	256K/512K	189/229
CARDINAL-200	800x600 VGA	88
CARDINAL-600	1024x768 VGA	159
HERCULES GRAPHICS STATION		649
PARADISE VGA+/VGA+16		SPECIAL
PARADISE 8514/A+		537
VIDEO 7 1024i	256K/512K	215/CALL
ORCHID Pro Design II	512K/1MB	CALL/315
NEC GRAPHICS ENGINE BOARD 16		595
NEC GRAPHICS ENGINE BOARD 256		889

MODEMS AND MISC

SOUNDBLASTER		157
AD-LIB MUSIC CARD		119
INTEL SATISFACTION BOARD		IN-STOCK
ADOBE POSTSCRIPT CART FOR LASERJET II		239
CARDINAL 2400BAUD/INT W/MNP-5		99
MEGAHERTZ MODEMS FOR LAPTOPS		CALL
MICROSOFT MOUSE ALL VERSIONS		CALL
MICROSOFT WINDOWS 3.0 W/MOUSE		109
LOGITECH C9 SERIAL MOUSE		79
LOGITECH TRACKMAN		95
LOGITECH 2 BUTTON SERIAL MOUSE		49

NETWORKING

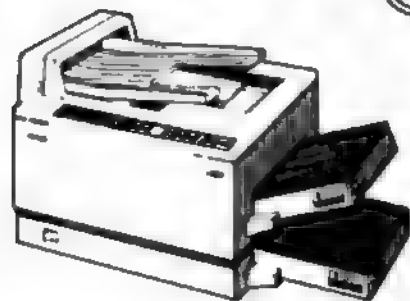
NOVELL ELS LEVEL I	4-USER	CALL
NOVELL ELS LEVEL II	8-USER	CALL
NOVELL ADVANCED NETWORK 2.15		1865
NOVELL NETWORK 382 V3.1		CALL
NE1000/NE2000 BOARDS		169/195

PACKARD BELL FORCE 386X

- 386SX 16MHz 1MB-RAM
- Includes Color VGA monitor
- 5.25" & 3.5" Floppies
- 40MB hard drive
- Lotus Works software
- MS-DOS 4.01 & GW-Basic
- 1-Year On-Site Warranty

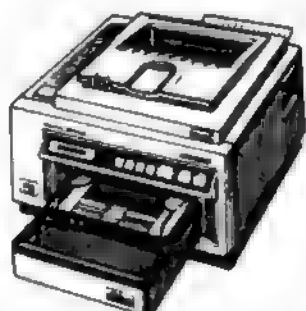
\$1625

Panasonic
Office Automation



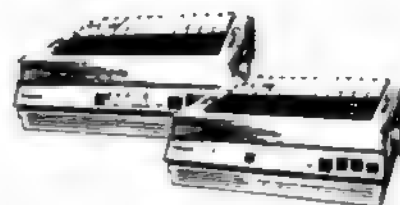
KX-P4450i LASER PARTNER

- Fast 11 pages/minute at 300 DPI
- Two 250 sheet trays
- Individual sheet loading
- 512K (max. 4.5MB) 28 fonts
- Emulates HP Laser II & Epson
- 1-year warranty



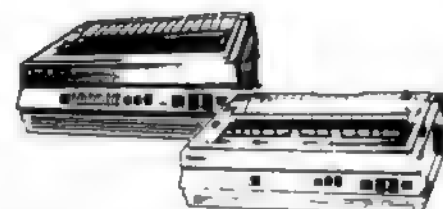
KX-P4420 PERSONAL LASER PARTNER

- 8 Pages per minute
- One 250 sheet tray
- 300 DPI resolution
- 512K Ram 22 internal fonts
- HP Emulation
- 1-year warranty



KX-P1180 & KX-P1191

- 9-pin printer.
- 240cps draft (192cps KX-P1180).
- Rear, top or bottom paper feed.
- Push/pull tractor.
- 6K buffer (2K on KX-P1180).
- Auto paper loading feature.
- Paper parking feature.
- Emulates Epson & IBM.
- 2 year Panasonic Warranty.



KX-P1124 & KX-P1624

- 24 pin high resolution printer.
- 192cps draft printing speed.
- Rear, front, top or bottom paper feed.
- Push/pull tractor.
- Auto paper loading.
- Paper parking.
- 6K buffer. (12K on KXP-1624)
- Emulates Epson and IBM.
- 2 year Panasonic warranty.

KX-P1624 WIDE CARRIAGE

**MIDWEST
COMPUTER
WORKS**

**DIRECT
ORDER
LINE**

800-669-5208

CUSTOMER SERVICE 708-459-6883 • FAX 708-459-6933

350 Lexington Drive, Buffalo Grove, IL 60089

ORDERS SHIPPED WITHIN 24 HOURS • IF YOU FIND A BETTER PRICE CALL US

CIRCLE 489 ON READER SERVICE CARD



- Your credit card is not charged until the product is shipped
- Personal and company checks will delay order 2 weeks
- Call us for quantity discounts
- Prices subject to change
- We check for stolen credit cards
- Foreign orders welcome

Paradise

ORDER TOLL FREE: U.S. & Canada - 1 800 348-4PCP (4727)
Japan - 0031-11-1865
Australia - 0014-800-126-943
In Hawaii - (808) 875-1100 FAX - 1 (808) 875-0061
Shipping & Technical Assistance - 1 (808) 875-1108

Quality at the best prices under the sun.
Specializing in International Orders



COMPUTERS

IBM PS/2	
PS/2 Mod 30286 30Mb	1715
PS/2 Mod 50Z 30Mb	1815
PS/2 Mod 55SX 30/60Mb	2415/2575
PS/2 Mod 65SX 60Mb	3550
PS/2 Mod 70 60/120/241	2915/3786/Call
PS/2 Mod 80 111/311	Call
PS/2 Mod 90-486	Call
PS/2 Mod 95-486	Call

COMPAQ	
DPro 386S Mod 1/40Mb	1930/2259
DPro 386E 40/110Mb	3485/3756
DPro 386/25E (All Models)	Call
DPro 386/33 84Mb	7299
LTE 286 20/40Mb	2420/2750
LTE 386	Call
SLT 386 60Mb	4722

AST	
Premium 286 512k	1047
Premium 386 16/25/33	Call
Premium 486	Call

TOSHIBA	
T1000 SE/XE	956/1376
T1200 HB/XE	1275/1970
T1600 20/40Mb	2120/2490
T3200	2683
T3100SX 40/80Mb	3744/4241
T3200SX	3866/4367
T5100	3293
T5200 40/100/200/Color	4488/4865/5302/5924
T8500	2099

PANASONIC	
FX1925	Lowest Price

SAMSUNG (All Configs.)	
	Lowest Price

MONITORS & TERMINALS

MONO/COLOR	
IBM 8503/12	215/475
Packard Bell 1474	96
Packard Bell 12"	75
Samsung 12"	80
Samsung RGB	200
Color/Mono w/Parallel Card	75

VGA/EGA Monitors	
IBM 8506/07/08	Call/Call/Call
IBM 8513/14/15	525/Call/Call
Mitsubishi 1381/HL6915	485/1950
NEC 2A/3D	460/593

NEC 4D/5D	969/2265
Packard Bell 8531/8541	345/290
Panasonic 1381/1391	396/491
Samsung VGA/4581/4592	
	344/430/309
Zenith 1492	585

VIDEO BOARDS

ATI VGA Wonder/512	210/251
Everex EGA/VGA	89/117
Paradise VGA/+16/VGA1024	
	122/145/175
Vega VRAM/VGA	395/135
Color/Mono w/Parallel Card	45

PRINTERS

CITIZEN	
120D/GSX140	135/295
HSP500/550	301/421

DICONIX 150	
P/S	327/333

HEWLETT-PACKARD	
LaserJet 3/3D	1589/2639
LaserJet 2P	967
DeskJet 500	497
Deskwriter/ScanJet	809/1069
PaintJet/XL	955/1680

FONTS & MEMORY	
Pacific Data 25-1	245
Pacific Data 1/2/4Mb	Call
Pacific Data Headliner	195
Pacific Data Page PS 4	350
Pacific Data Plotter in a Cig	225
CPI Jet Memory	155
CPI Jet Page/Superset	319/275

IBM	
4019 Laser	Call
Proprinter XL24E/X24E	Call

NEC	
2200XE	243
6200/6300	459/619
LC 290 Postscript	2450

OKIDATA	
ML 182	220
ML 320/321	324/451
ML 380	289
ML 390+/391+	449/613
ML 393+/393+ color	968/1055

PANASONIC	
1124	275
1624/1695	370/390

1180/1191	145/212
4420 Laser	801

TERMINALS

Wyse 50/60	349/280
Wyse 30/85	271/350
Wyse 150/185	261/349

SOFTWARE

Aldus Pagemaker 3.01	490
Ashton Tate dBase III+/IV	319/479
Borland Quattro Pro 2.0	295
Carbon Copy	105
Harvard Graphics 2.3	289
IBM Displaywrite 5.0	229
Lotus 1-2-3 2.2/3.1	340/395
Microsoft	All Titles-Lowest Price
Microsoft Windows 3.0	90
Norton Adv. Util 5.0	110
Procomm Plus	51
Ventura Desktop Pub	500
WordPerfect 5.1	245
400 Additional Titles In Stock	

PLOTTERS AND DIGITIZERS

HEWLETT-PACKARD	
7475A/7550A	1349/2645
7570A/7575A	2699/3343
7576EXL	4399

SUMMAGRAPHICS	
Summasketch 2 12X12/12X18	335/555
CALCOMP	
1023/25	3595/4820
12X12/12X18	370/666

MULTIFUNCTION BOARDS/CARDS/CHIPS	
IBM 5250 Emulation	656
AST 5251 Emulation	489
AST 6-Pack	132
Intel AboveBoard	325
Intel InBoard	492
Orchid Tiny Turbo	219
8087-2/3	110/Call
80287-XL	184
80387-SX/16/20/25/33	
	290/320/378/462/562

MEMORY

Compaq 1/4Mb 386/S/E	118/390
Compaq 4Mb Exp Board	440
Laser Jet 2/2D 2Mb	195

Laser Jet 2/2D 4Mb	362
Laser Jet 2P/3 1/2Mb	122/222
IBM/Toshiba Memory	Call

MODEMS & COMMUNICATIONS

CPI 2400 Internal	86
CPI 2400 Ext Fax	123
CPI 2400 Ext MNP	154
Everex 2400/2400e	105/164
Everex 2400 w/MNP	193
Hayes 2400/2400B	319/218
Hayes 2400 PS2/9600	321/743
Intel 2400/9600	Call
MegaHertz 2400 Internal	141
Practical Perif. 2400/9600	132/Call
US Robotics 2400/14400	80/579

FAX MACHINES

Toshiba 3200/3400	525/645
Toshiba 3600/3750	Call/825
Sharp 220/330	Lowest/625
JT Fax 9600	525

MICE

Logitech C9/Bus/PS2	82
Logitech Scanman/PC/PS2	169/202
Microsoft Mice/+Windows 3.0	103/145

DRIVES & TAPES

SEAGATE	
ST225/238	179/192
ST251-1/157A	239/242
ST1126A/1162A	630/700
ST4096/4182E	530/925
ST4383E	1489
Plus 20/40/80Mb	480/540/640
Everex 40/60Mb Tape	250/650
Irwin 40Mb Tape	390
Toshiba External 3.5/5.25"	Lowest
Panasonic LF5010 Worm	2056

NETWORK

Call us For The Best Prices Anywhere

MISC & ACCESSORIES

Keytronic 101/5151	120/85
Kensington Masterpiece/Plus	85/95
AB Switch Box	27
TrippLite 450/1200/2000 296/618/1175	
4 outlet surge	39

All orders shipped insured next or second day air via **FEDERAL EXPRESS** / 24-hour worldwide order tracking / Printer Orders received by 9 PM CST can be shipped same day / All credit card and COD orders checked electronically / We accept Amex, Visa, MC, JCB, Discover, Diners Club, COD's, Wire Transfer, Letter of Credit, **TERMS & LEASE AVAILABLE** (one day approval) / Credit cards not charged until product shipped **GOVERNMENT AND EDUCATIONAL P.O.'S ARE WELCOME** / Allow 10 days for personal checks to clear / Prices reflect a 3 per cent cash discount / Non-defective returns subject to a restocking charge / All warranties good through Paradise Computer Products / **HOURS: 8:30 AM TO 8:30 PM CST MON-FRI, 10 AM TO 4 PM CST, SAT.**

Paradise Computer Products Ltd. P.O. Box 880953 Dallas, TX 75389-0553

CIRCLE 145 ON READER SERVICE CARD





If You're Not Buying From **Bulldog** — You're Barking Up The Wrong Tree!

BULLDOG SYSTEMS

286 12 MHz	
1 mg Ram, 1.2 floppy	\$599
286 16 MHz	
1 mg Ram, 1.2 floppy	749
286 20 MHz	
1 mg Ram, 1.2 floppy	819
386 20 MHz	
1 mg Ram, 1.2 floppy	1155
386 25 MHz	
1 mg Ram, 1.2 floppy	1215
386 25 CACHE	
4 mg Ram, 1.2 floppy	1895
386-33 CACHE	
4 mg Ram, 1.2 floppy	2250
486-25 CACHE	
4 mg Ram, 1.2 floppy	3199

FREE shipping on all **BULLDOG** systems prepaid with a Cashiers Check, Money Order or Bank Wire!

AST SYSTEMS

AST Premium 286 Model 70	1075
AST Premium 386 Model 300C	2679

PANASONIC

FX 1925S w/1mb, 40mb hard drive, Super VGA card & monochrome VGA monitor	1575
--	------

LAPTOPS

<i>You can take these lightly!</i>	
Toshiba 1000	655
Toshiba 1000SE	1105
Toshiba 1000XE	1595
Toshiba 1200HB	1759
Toshiba 1200XE	2195
Toshiba 1600 20 40	2310
Toshiba 3100SX 40/80	4099
Toshiba 3100F 40	2944
Toshiba 3200 3200SX	3059
Toshiba 5200 40/100	4915
Panasonic CF170 Notebook	1389
Panasonic CF270 Notebook	1869
Atari Portfolio Palmtop	249
<i>Pacific Rim external drives available for most Laptops - Call for prices! Kingston Memory for most Systems Call for pricing!</i>	
Diconix 150+ or Canon BJ10e (with the purchase of any laptop)	315

MACINTOSH CORNER

Adobe Illustrator	345
Aldus Pagemaker V4.0	495
Color Set	205
Filemaker Pro	205
Fontbase + V2.0	209
Mac Draft	175
Mac Draw	250
Mac Write II	122
Microsoft Excel	250
Microsoft Word	250
ORG Plus	125
Studio 32	492
Survive 3D V1.2	320
WordPerfect V1.03	220
Datashow 480	1245
Mac Sync	425
Impulse 42	335
Impulse 84	495
Impulse 168	799

FAX

Ok Fax	Call
Teleshare	\$129
Toshiba 3450 3750	659, 729
Toshiba 4400	554
Epson 3000	625
Everex 24/96 int ext	\$249 319

PRINTERS

EPSON	
LX 810	\$173
FX 850 1050	289 399
LQ 510	259
LQ 850 950	435 439
LQ 1010 1050	369 569
LQ 2550	799
EPL 7000	849
LQ 860	549
DICONIX	
Diconix 150+	345
SEIKO	
Smart Label	189
OKIDATA	
172	199
182 Plus	229
320/321	319 449
381	285
390 Plus/391 Plus	449 605
393 Plus	955
393 Color Plus	1069
OKI LASER	
840 820	2039 1359
800 400	1020 655
TOSHIBA	
Express 420.440	319 449
NEC	
P3200 P3300	295 419
P9300	289
2000 XE	249
6200 6300	479 639
Smart Writer II 90	1659
PANASONIC	
1124	279
1180	149
1191	229
1624	359
1695	389
4420	779
4450	1199
4455	1999
HEWLETT PACKARD	
Laser Series II/Laser Series III	1179, 1599
Laser II D	Call
Laser II P	999
Desk Jet 500	559
LASER ACCESSORIES	
Pacific Data 1 mb/2mb	139/179
Pacific Data 25 N 1 for HP/II HP/III	259
Pacific Bar Code	315
Pacific Outlines	189
Pacific Page	339
Plotter in a Cartridge	229
Headlines in a Cartridge	199
Pacific Print	219
CANON	
BJ 130E	639
LB P4	955
LBP 8 III	1799
BJ 10F	339

GRAPHIC CARDS

Dfi Mono/Color	89
Everex Micro Enhancer	59
Everex Viewpoint VGA 256-512	142 179
Genoa Super Hi Res	145
Genoa 6300 Genoa 6400	199 239
Hercules Graphics Card	179
Hercules InColor	145
Hercules VGA	119
Orchid Pro Designer/e	189
Orchid Pro Designer II w/512K	279
Paradise VGA Plus	135
Paradise VGA Plus 16	169
Paradise 1024 w/512K	229
Vega VGA	139
V Ram w/512K	349
Video 7 VGA 1024/256K 512K	169 219
ATI Wonder EGA 800 +	129
ATI VGA w/256K 512K	209 259
NEC Graphics Engine 256K	899
Cardinal VGA 100 200	79 89
Cardinal VGA 300 400	99 109
Cardinal VGA 500 600	125 159
Cardinal VGA 700 w/512K	225

TAPE DRIVES

Everex Excel 40F 60F	225 245
Everex 60 mb int/ext Teac	595 699
Everex 60 mb int/ext Wangtech	679 789
Archive 40 mb int/ext	249 409
Archives FT 60 int or ext w/card	589
COLORADO MEMORY SYSTEMS	Call

NETWORK

<i>Call for the best pricing on all your networking needs!</i>	
Advanced Network	1859
ARC Net PC 130 130E	99 129
ARC Net Active Hub Passive Hub	289 79
ARC Net PC 500FS, 500WS	305 235
Lantronic 2mb Starter Kit/Adapter	389/179
Lantronic 10mb Ethernet	
Starter Kit Adapter	519/249
Level 1/Level II	439/1059
NE 1000 NE2000	155/189
SFT	2639
Western Digital Ethernet Plus	179
Gateway 3 Com, Thomas Conrad and	
Western Digital	Call for Price!

DRIVES

Conner 40 110	339/569
Seagate 20mb w/contr ST225	239
Seagate 30mb w/contr ST238	249
Seagate 40mb for AT ST251.1	249
Seagate 80mb ST 4096	549
Ext Drives for PS/2 360 1.2	169 199
Toshiba 3 1/2" 720K int	69
Toshiba 3 1/2" 144mb int	79
Toshiba 5 1/4" 360K int	75
Toshiba 5 1/4" 1.2mb int	79
Bernoulli Box II 5 1/4" 20mb int	1009
20mb ext w/card	1309
dual 20 mb ext w/card	1979
44mb internal w/card	1099
Plus Hard Card 20 40	489 549
Plus Hard Card II 40 80	849 595
Plus Hard Card 50XL/105XL	389 675
Western Digital IDE 40	299
Maxtor 40 meg #805 AT	299

MICE & MISC

Keycat II - 101 Keyboard w/Trackball	89
Microsoft Mouse w/windows 3.0	159
Microsoft Mouse w/PC Paintbrush	109
Mousesystems Mouse	89
Logitech Scan Man/Scan Man 256	179/295
Logitech Series 9 Serial/Bus	69/79
Logitech Track Man Serial Bus	79/85
Summasketch 12x12/12x18	339/579
The Wave Keyboard	69
Marstek 105 w/Paintbrush and OCR	169
Marstek 800 w/Paintbrush and OCR	209
Marstek 800 for Windows	229
Epson ES 300 C Color Scanner	1450

SOFTWARE

Aldus PageMaker	\$495
Carbon Copy	118
Clarion ProDeveloper	449
Clipper 5.0	499
Corel Draw	325
Dbase IV	489
Enable O/A	415
Finesse V3.1	110
Fontbase	195
Freelance Plus	325
Framework III	455
Harvard Graphics	299
IBM DisplayWrite V	229
Lotus 2.01/2.2	299 345
Lotus 3.1	89
Lotus Symphony	489
Manager's Organizer	149
Microsoft Word	219
Microsoft Word for Windows	319
Microsoft Excel	299
Multimate 4.0	249
Peachtree III Complete	139
Paradox V3.5	489
Procom Plus	69
Q & A	225
Quatro Pro	315
Rbase V3.1	485
Super Calc V	299
Ventura Desktop Publ	529
Word Perfect 5.1	249
WordStar 5.5/6.0	179 219
WordStar 2000 +	279
Peachtree Double Bonus	219
Microsoft Windows 3.0	109
Lots of other software available and all the prices are byte size!	

MULTI FUNCTION BOARDS

AST 286 6 Pack w/OK w/1mb	105 169
AST 6 Pack Plus w/384K	145
AST 525111 Enhanced	499
AST Rampage 286	319
Everex Mini Magic w/o K	75
Intel Above Board w/512K	345
Intel Above Board PS w/512K	375
Intel Inboard 386 w/adapter	985
Intel Inboard 386 for PC w/1 mb	510
Intel Above Board II Plus	299
Intel Above Board +8 w/2mb	419
Intel Satsatxton	415
Irma Board III	445
Logical Connection 256/512K	469 445
Orchid Ramquest 16/32 w/o K	289
Orchid Ramquest 8-16 w/1 meg	315
Orchid Tiny Turbo 286	205
Orchid Tiny Turbo Extra	249
Orchid Tiny Turbo AT	359
Expans	159

MATH CO-PROCESSORS

INTEL	
8087 3	79 387 25 505
8087 2	129 387 33 579
87 16	319 387 SX 319
387 20	405 287 XL/XLT 205
CYRIX	
387 16	275 387 33 476
387 20	409 387 SX16 245
387 25	390 387 SX20 245
1mb Simm 80NS	
256K Simm 80NS	59
Simm, Dram and Sipp	Call
IIT	
287 8 10	139 165 87 16 20 259 299
287 12 20	179 199 87 25 479
87SX 16 20	239 259 87 33 465

MONITORS

<i>Get The Picture!</i>	
NEC	
MULTISYNC	
2A/3D	
4D 5D	499 659
PANASONIC	
1381/1391	989 2350
SAMSUNG	
14" VGA Flat White/Color	125 359
MAGNAVOX	
Amber 776-RGB80 8762	89 255
MITSUBISHI	
Diamond Scan	499
HI 6605 15"/HI 6905 19"	1109 1919
ZENITH	
1492	629

All prices are cash prices! Retailer may have slightly higher prices.

Policy: Add 3.12% maximum \$10 shipping and handling. Larger shipments may require additional charges. Personal checks require 2 weeks to clear. For faster delivery use insured credit cards or send cashiers check or bank money order. Georgia residents add sales tax. All prices are 25% prices and are subject to change and all items are subject to availability. Defective software will be replaced with same item price. Hardware will be replaced or repaired at our discretion within the terms outlined in the manufacturer's warranty. We cannot guarantee compatibility of all items and final and returned equipment are subject to a working test. All returns must be accompanied by the name of the original purchaser. Returns are subject to a restocking fee.

WE ACCEPT



Purchase Orders
w/Approved Credit



SALES HOT LINE

1.800.438.6039

Shipping Information and
International Customers: 1.404.860.7364
FAX: 1.404.860.7358



BULLDOG

COMPUTER PRODUCTS

P.O. Box 1190 • 610 Industrial Park Drive
Evans, Georgia 30809
HOURS: Monday thru Friday 8:30 a.m. to 7:30 p.m.
Saturday 9:00 a.m. to 4:00 p.m.

MEMORY UPGRADES



WE ACCEPT INTERNATIONAL ORDERS
3 day International delivery via Federal Express or DHL!
CALL (714) 588-9866 FAX (714) 588-9872

100%
COMPATIBLE OR
YOUR MONEY BACK

TOLL FREE FROM ANYWHERE IN THE U.S. OR CANADA

ORDER NOW 1-800-535-5892

LAPTOP MEMORY

TOSHIBA

Model 1000SE XE LE	1MB	\$269.00
	2MB	\$299.00
Model 1000LE, 2000SX	4MB	\$749.00
	8MB	\$1399.00
Model T1200XE	2MB	\$179.00
Model T1500	2MB	\$179.00
Model T3100E	2MB	\$179.00
Model T3100SX	2MB	\$179.00
	4MB	\$499.00
Model T3200SX	2MB	\$179.00
	4MB	\$499.00
Model T3200	3MB	\$299.00
Model T1500	2MB	\$179.00
Model T5200, T5500	2MB	\$179.00
	8MB	\$1189.00

COMPAQ

Portable LTE 286	1MB	\$135.00
	2MB	\$165.00
	4MB	\$795.00
SLT-286	1MB	\$165.00
	4MB	\$795.00
SLT-386	1MB	\$225.00
	2MB	\$395.00

ZENITH

SuperSport 286, 286e	1MB	\$179.00
SuperSport SX, 286e	2MB	\$325.00
SuperSport SX	2MB A or B	\$295.00

NEC

ProSpeed 286 and	1MB	\$269.00
386SX 16	4MB	\$749.00
ProSpeed 386	2MB	\$489.00
	8MB	\$1659.00

IBM MEMORY

Model PS-1		
512K Kit	1057035	\$89.00
2MB	IBM PN N A	\$399.00
Models 30-286, Exp. Board 1487259		
512K Kit	30F5348	\$45.00
2MB Kit	30F5360	\$139.00
Models 70-E81/121, 55SX, 65SX		
1MB	6450603	\$79.00
Models 70-E81/121, 502, 55SX, 65SX		
2MB	6450604	\$139.00
Models 55SX, 65SX, 34F3077 & 34F3011		
4MB	34F2933	\$399.00
Model 70-A21		
2MB	6450608	\$149.00
Models 80-A21/A31		
4MB	6451060	\$549.00
All Models 70 and 80		
2-8MB w/2M	6450605	\$499.00
2-14MB w/2M	34F3077	\$539.00
Models 90, 9XZ, 90 & 95SX		
8-8MB w/2M	1497259	\$399.00
2-16MB w/2M	6450609	\$809.00

LASER PRINTER MEMORY

Hewlett-Packard LaserJet HP, III & IID		
1MB	334748	\$89.00
2MB	334758	\$159.00
4MB	334778	\$279.00
Hewlett-Packard LaserJet II & IID		
1MB	334448	\$169.00
4MB	334458	\$289.00
Panasonic 4450I and 4420		
1MB	KX-P443	\$169.00
2MB	KX-P441	\$229.00
IBM Laser 4019 and 4018e		
1MB	1039136	\$189.00
2MB	1039137	\$219.00
3 MB	1038675	\$299.00
Canon LBP-8II, 8IIR, 8IIT		
2MB	S63 1880	\$169.00

COMPAQ MEMORY

DeskPro 286-E, 386-20/20E/25		
1MB	113131-001	\$119.00
4MB	113132-001	\$319.00
DeskPro 386/16		
1MB	113646-001	\$119.00
4MB	112534-001	\$319.00
DeskPro 286N, 386N and 386SX and 20		
1MB	118688-001	\$79.00
2MB	118689-001	\$149.00
4MB	118690-001	\$449.00
DeskPro 386-33, 486-33 & SystemPro		
2MB	115144-001	\$189.00
8MB	118561-001	\$1189.00

AST MEMORY

Premium 386/16 and 386-16		
1MB Kit	500510-007	\$85.00
4MB Kit	500510-008	\$239.00
Premium 386-20		
1MB Kit	500510-003	\$99.00
4MB Kit	500510-004	\$319.00
Premium 386-SX 16/25/33 and Cupid card		
1MB	500718-002	\$79.00
Premium 486		
2MB	500718-004	\$219.00
Premium II 386SX 20 and 386SX 16		
1MB	800780-003	\$109.00
4MB	800780-004	\$589.00

ZENITH MEMORY

Zenith Z-386/20 25/33 & 33E		
1MB	ZA36/3800ME	\$79.00
4MB	ZA3800MK	\$419.00
Zenith Z-386/25 & 33		
2MB	ZA3600MG	\$149.00
Zenith Z-386 SX		
2MB Kit	Z-605-1	\$149.00
Zenith TurboSport 386e		
1MB	ZA 3034 ME	\$259.00



BRAND NEW!

For IBM PS 2 Models 90 & 95		
2MB		\$249.00
4MB		\$589.00
For IBM RISC 6000 320 and 530		
16MB		\$CALL
32MB		\$CALL
For SHARP or TI Notebook		
1MB		\$249.00

SIMMS DRAM

IBM TYPE	1MX1
4Mx9-80	\$299.00
4Mx9-10	\$56.00
4Mx9-80	\$56.00
4Mx9-10	\$60.00
56x9-10	\$17.00
56x9-80	\$18.00
56x9-60	\$20.00
1MX1-10	\$5.50
1MX1-80	\$8.00
1MX1-70	\$6.50
256KX1	
256KX1-10	\$1.80
256KX1-80	\$2.00
256KX1-70	\$2.50

TERMS AND CONDITIONS

- SEND P.O.'S AND MAIL ORDERS TO:
First Source International, Inc.
38 Argonaut, Suite 140
Aliso Viejo, California 92656
PH: (714) 588-9866 FAX: (714) 588-9872
- ✓ **TERMS:** AMEX, VISA, MasterCard, C.O.D. P.O.'s
- ✓ **WARRANTY:** 5 Year Memory Warranty! Best Brands!
- ✓ **COMPATIBILITY:** 100% compatible or your money back!
- ✓ **DELIVERY:** 3 day International delivery via Federal Express or DHL!
- ✓ **MANUFACTURER'S WARRANTY:** 100% compatible or your money back!

100% COMPATIBLE OR YOUR MONEY BACK!

CIRCLE 282 ON READER SERVICE CARD

MORE MEMORY FOR LESS

Memory Upgrades for PC's and...

IBM PS/2 Model 30/ 50/55/60/65/70/80/90/95 ... plus
COMPAQ SystemPro, DeskPro, LTE, SLT SHARP PC 6220
TOSHIBA T1000SE, T1000XE, T1600, T3100e, T3100SX, T5100
ZENITH 386 & Supersport TI Travel mate MAC IIs/ci/cx ... plus
AST Premium 386, 486 & Bravo NEC Powermate HP Vectra

Workstations and...

APOLLO SUN IBM AT & T DEC SILICON GRAPHICS

Laser Printers

IBM HP OKI EPSON PANASONIC TI FACIT C.I.TOH TOSHIBA

COMPAQ 386 4Mb \$283 2Mb: SLT386/20 \$369 LTE 286 \$193

IBM PS/2 80 2Mb \$164 50/50Z 2-8Mb \$345 30/286 \$132

SUN SparcStation 16 Mb \$1,540 HP IIP & IID 4 Mb \$264

CIRCLE 539 ON READER SERVICE CARD

5 Year Warranty
Technical Support
100% Compatible

Same Day Shipping
P.O.'s Welcome
Visa, MC, Amex

SOUTH COAST

10920 Wilshire Blvd
Suite 1100
Los Angeles, CA 90024

(800) 289-8801

(213) 208-3260 (213) 208-3282 Fax

Mon-Fri 8:00 AM - 6:00 PM (PST)

Established 1984

All trademarks recognized

Memory & Hard Drives

-and so much more!

New Lowest Prices! 5 Year Memory Warranty! Best Brands!

TOSHIBA T1000SE	2MB \$299
T1000SX T3200SA T1600 T3100E	2MB \$179
T3200	3MB \$349
T5100	2MB \$179
ZENITH Supersport 286	1MB \$179

Best selling mem. boards, 80ns chips

Bucaram AT Bus 16-bit 2MB \$229 4MB \$374	
Bucaram XT Bus 16-bit 1MB \$159 2MB \$212	

COMPAQ fully compatible memory

386/20 25 20e 25e 386s modules	1MB \$119	4MB \$319
386/20e 25e 386s expansion boards		
1MB \$159	4MB \$369	
486/33 486/33 System modules	2MB \$219	
386/20 boards	1MB \$319	4MB \$910
386/20 expansion kit for boards	1MB \$119	
SLT boards	1MB \$199	
Portable II requires exp. board	2MB \$169	
LTE	1MB \$119	2MB \$199

IBM PS/2 easy memory expansions

Western-Digital 93044-A	29rms. IDE	\$279	Seagate ST2778-1	6.5MB 2 Hds. 8LL	\$289
NEC-RK 1472-22MB	30rms. IDE	\$249	Seagate ST2778-1	6.5MB 2 Hds. 8LL	\$499

FREE! Enjoy educated savings with our famous TENEX tutorial catalog. Please call toll-free for yours today! Guaranteeing customer satisfaction since 1982.



Floppy Disk Drives

360K 5.25" Half Height Black	\$75
720K 3.5" Half Height Black	80
1.2M 5.25" Half Height Grey	85
1.44M 3.5" Half Height Grey	95

Hard Disk Drives

Conner IDE

40M 28ms	\$459
100M 25ms	679
200M 19ms	1249

Imega

B1201 20M Internal	\$745
B1441 40M Internal	959
B244X Dual 5.25 44M External	1895
PC2B/50 Bootable Card	199

Seagate

20M 65ms ST225 Half Height	\$209
20M 35ms ST125 Half Height	229
30M 35ms ST138 Half Height	245
40M 28ms ST251-1 Half Height	289
40M 24ms ST151 Half Height	419
80M 28ms ST4096 MFM	590

Tape Backups

Archive/Maynard

VP1501 150MB Internal Novell certified ..	\$895
VP150E 150MB External Novell certified ..	1175
VP402 Interface Board for VP Series	115
VP409 PS/2 Interface Board for VP Series ..	230
VP60 Internal	639
VP60 External	795
Mayntream 2200HS 2.2GB Portable ..	4350

Peripherals & Software

Monitors

Mitsubishi	
1381 14" Diamond Scan (to 800x600) ..	\$499
HL6805 16" SVGA/EGA (to 1280x1024) ..	1075
HL6905 20" SVGA/EGA (to 1280x1024) ..	2049
NEC	
GS-2A 14" MultiMono (to 800x600) ..	\$229
2A 14" SVGA (800x600)	479
3D 14" SVGA/EGA (1024x768)	629
4D 16" SVGA/EGA (1024x768)	Call
5D 20" SVGA/EGA (1280x1024)	2350
Panasonic	
C1391 PanaSync (to 800x600)	\$489
C1381 PanaSync (1024x768)	Call
Princeton Graphics	
Max15 14" Mono (to 1024x768)	\$249
UltraSync 14" SVGA/EGA (800x600) ..	520
UltraSync 16" SVGA/EGA (1024x768) ..	879
Princeton Publishing Labs	
Multiview 15" Mono DTP w/adaptor ..	\$690
PC Brand	
14" VGA Mono	\$129
14" VGA Color .31DP (640x480)	349
14" VGA Color .41DP (640x480)	299
14" SVGA Color (1024x768)	399
Seiko	
1440 14" SVGA (1024x768)	\$599
1450 14" SVGA (1024x768)	779
Sony	
CPD 1320	\$485
CPD 1304 14" SVGA (to 1024x768) ..	689
Zenith	
ZCM1492 VGA FlatScreen (640x480) ..	\$639

Video Cards

ATI	
VGA Wonder+ 256K/512K	\$249/289
NEC	
PC Magazine's Editors Choice	
Graphics Engine 16 (1024x768)	\$679
Graphics Engine 256 (1024x768)	969
Video Seven	
1024i VGA with 256K/512K	\$225/265
VRAM VGA with 512K	399
PC Brand	
VGA (640x480) 8 bit	\$79
VGA (1024x768) 16 bit 256K	119
VGA (1024x768) 16 bit 512K	Call
VGA (1024x768) 1MB	Call

Modems

ATI	
2400ETC Internal with MNP5	\$159
2400ETC External with MNP5	189
Hayes	
1200B Internal with Smartcom	\$189
2400B Internal with Smartcom	259
1200 External	285
2400 External	359
PC Brand (100% Hayes Compatible)	
1200 Internal with software	\$49
1200 External	70
2400 External	99
2400 Internal with software	75
2400 Internal with MNP5	99
US Robotics	
Courier HST 14,400 Internal	\$559
Courier HST 14,400 External	599
Courier V.32 9600 External	675
Courier Dual Standard External	995

Fax Cards

Complete PC	
Complete Fax 4800/9600	\$159/309
Complete Communicator	419
Complete Portable Fax 9600	309
Intel	
Connection Coprocessor	\$529
Satisfaxion	399

Co-Processors

Intel	
8087-1	\$189
80287-10	229
80387-16	349
80387-25	479
Wetask	
Abacus 3167/4167	Call
ITTI	
All models	Call

Colorado Memory Systems

DJ-10 Jumbo 40/120MB Internal	\$249
KE-10 External Chassis Kit with Interface ..	139
QFA500	830
TC-02 Controller	Call

Call for Prices on
Other Peripherals & Software!

CD-ROM

Microsoft

Bookshelf 1.0	\$195
Stat Pack	99
Programmer's Library	295

NEC

CDR62 Internal	\$654
CDR72 External	729
CDR35 Portable	439
XT/AT Interface Kit	149
Clipart 3D	285
Image Folio	285

RAM/I/O and Accelerator Boards

Intel

Aboveboard Plus 512K	\$349
Aboveboard Plus I/O	385
Aboveboard Plus 8 2Mb	529
Aboveboard Plus I/O 2 Mb	615
Inboard 386 PC with 1M	539
Inboard 386 AT with 0K	859
PC Brand I/O Cards	
AT 1P/2S/1G	\$49

Call for Prices on
Other Peripherals & Software!

**PC Brand
Internal Modem**
(100% Hayes Compatible)

\$49
1200bps

\$75
2400bps

Printers

Canon	
BJ10 Portable	Call
BJ130e 15"	695
LBP4 Laser 4PPM	899
LBP8-III Laser 8PPM	1650
Citizen	
GSX 140	\$295
Color Option	49
Hewlett Packard	
LaserJet IIP	\$995
LaserJet III	1650
Deskjet 500+	Call
LaserJet IID	Call
Kodak Diconix	
150Plus	\$330

Laser Jet Accessories

Adobe (New!)	
HPLJII Postscript Cartridge	Call
Pacific Data Products	
Plotter in Cart. for II or IIP	\$249
25 in 1 Cart. for III or IIP	285
Postscript Cart. for III or IIP	375
1M Memory Card for IIP	189
CPI	
Superset+ 425 in 1	\$295
Jet Memory 1M for III or IIP	189
Postscript for IID, IIP, III	355
Princeton Publishing	
PS-388 Postscript board	\$2250

Call about 600dpi Postscript
Compatible Laser Printers
for under \$2000

Networking Hardware

Call for SMC and Western
Digital IOBase-T products.

Lantronic	
2 MBs Starter Kit	\$409
2 MBs Adapter	195
Ethernet Starter Kit	545
Ethernet Adapter	289
Standard Micro	
PS110 Board for PS/2	\$395
PC500 16 Bit for WS	260
PC500 16 Bit for Server	335
PC550 16 Bit Twisted Pair for WS	291
PC550 16 Bit Twisted Pair for Server	355
PC270E Twisted Pair	139
PC130 Arcnet Board	117
ARCNET passive hubs	72
ARCNET active hubs	321
ARCNET intell. hub coax	495
ARCNET intell. hub Twisted pair	609
Synoptics	
505UTP Transceiver	\$139
1000 Concentrator	2575
2500 Workgroup Concentrator	839
Western Digital Ethercard+	
8 bit	\$169
Twisted Pair	319
PS/2	285
/EPB PS/2	285
8 bit with ROM Socket	205
16 bit	219
Xircom	
Pocket ARCNET Adapter Coax	\$295
Pocket ARCNET Twisted Pair	295
Pocket Ethernet Adapter Twisted Pair	489

Novell Networking

(Novell Authorized Sales and Support)

4 User ELS Level I v. 2.12	\$519
8 User ELS Level II v. 2.15	1195
Advanced Netware v. 2.15	2095
SFT Netware 286 v. 2.15	3095
SFT Netware 386 v. 3.1	5049

Network Utilities

Brightwork Development	
PS-Print	\$279
Queue ITI	\$105
CC: Mail	
25 User	\$495
Expand	\$445
Remote	235
Gateway	895
Cheyenne Software	
Netback	\$189
Monitrox	\$505
De Vinci eMail Servers	
DOS	\$849
DOS/Windows	1349
Lan Systems	
Lanspace	\$310
Lanspool	\$259
Norton-Lambert Close-up	
Support 3.0 ..	\$179
Customer 3.0	\$135
Ontrack	
Disk Manager -N\$99	Netutils
	\$85
Tops	
NetPrint 2.0 ..	\$145
Network Bndl	\$169
Traveling Software	
Desklink 2.2 ..	\$95
Laplink III ..	\$92

Unix/Xenix Multiuser Products

Digiboard	
Intelligent Serial Cards:	
4 Port/8 Port	\$595/795

PC Brand Super VGA Monitor \$399



Software

Autodesk Animator	\$239
Borland Quattro	95
Quattro Pro	329
Caere Omnipage 386 2.1	619
Datastorm ProComm Plus	59
dBase IV 1.1	479
Microrim R:Base 3.1	549
Delta Technology Direct Access	59
Deskview 386 v. 2.26	125
Fifth Generation Fastback Plus	109
Fox Pro	Call
Harvard Graphics	329
Generic CADD Level 3 v. 5.0	285
Lotus Freelance Plus	329

At Unbeatable Prices!

NEC	
P2200XE	\$279
P9XL	1030
P6200	499
P6300	675
LC890XL	3995
LC260	Call
LC290M	Call
Okidata	
ML320	\$345
ML321	479
ML380	315
ML390+	475
ML391+	655
ML393+	995
Panasonic	
1180	\$169
1191	235
1124	295
1824	389
1895	415
4420 Laser	885
Seiko	
Smart Label	\$185

Scanners/Digitizers

Complete PC	
Half Page Scanner	\$189
Full Page Scanner	499
Hand Scanner	165
Complete OCR Software for HS/Page	235/309
Microltek	
MSF 300G	\$1495
MSF 300Z	Call
MSF 400G/MSII	2750/1050
Summasketch II Digitizers	
12x12/12x18	\$335/599

Input Devices

CalComp WIZ 1000 DPI	\$175
Pen Option	60
Logitech	
Hi-Rez C9 Serial Mouse	\$79
Hi-Rez C9 Bus Mouse	92
Trackman 320 DPI Serial/Bus	99/109
Microsoft Mice	
Serial with Paintbrush 400 DPI	\$109
Serial with Windows 400 DPI	149
Bus Mouse with Paintbrush	105
Bus Mouse with Windows	149

Power Protection Products

Tripplite	
SK6 Spike Bar	\$29
CCI+ Isober	585
IB4 4 Outlet Isober	45
LC1200 Line Conditioner	159
BC325 Battery Back-up	246
BC450 Battery Back-up	297
OMNI 450LAN Battery Back-up	375
BC750LAN Battery Back-up	549
OMNI1200 Battery Back-up	795

16 Port	1395
Wyse Terminals	
WY60	\$309
WY150	\$305
WY370 14" Color	945
(Call for Keyboard options)	
Santa Cruz Operations	
SCO Unix 386 Operating System	Call
SCO Unix 386 Development System	Call
Xenix Software	
Foxbase+ 388	\$779
Microsoft Word	495
VP/IX 2/3+ User	359/629
Word Perfect 5.0 1 user	295

Lotus 123 r. 2.2349	409
Lotus 123 r. 3.1	209
Microsoft Works99	125
Word 5.0	95
Norton Utilities Advanced v. 5.0	149/225
Paradox v. 3.0	145
PC Tools 6.0	65
Peachtree Acctg III w/Data Query	159
Pro. Write	379
QEMM 5.1	115
Quicken	249
Timeslips III	249
Symatec Q&A	519
Timeline 3.0	
Timeworks Publish It!	
Word Perfect 5.1	
Wordstar 6.0	
Ventura Publisher 2.0	

Software for Windows 3.0 Environment

Aldus Pagemaker	\$499
AMI	129
AMI Pro	319
Corel Draw v. 1.2	329
Microsoft Windows 3.0	99
Microsoft Excel 2.1	309
Microsoft Word for Windows	325
Precision Software Superbase 2	189
Precision Software Superbase 4	395
Crosstalk for Windows 1.0	129
Ventura Publisher-Gold	Call

Call for Prices on
Other Peripherals & Software!

Supplies

Sony 5.25" 380K (box)	\$9
Sony 5.25" 1.2M (box)	14
Sony 3.5" 720K (box)	13
Sony 3.5" 1.44M (box)	25
5.25" Diskette Case	9
3.5" Diskette Case	11
Toner Cartridge for HP Deskjet Plus	
LaserJet II and IIP	Call
Data Cartridges	
DC2000 (ea.)	\$19
DC600(ea.)	\$27
DC800XTD (each)	29

30-Day Money-Back
Guarantee
Toll-Free Service & Support
No Credit Card Surcharges

Plotters

CalComp	
1025	Call
1023	3695
1043DM	5700
1044	Call

1-800-PC BRAND

TEL: 1-800-722-7263 FAX: 1-800-722-7392

PC Brand, Inc. 954 W Washington St., Chicago, IL 60607
International Fax #312-633-2888 International Voice #312 226-5200 We are open Mon. thru Fri.
7am to 7pm; Saturday 8am to 4pm Central Time MasterCard, VISA, Discover, PC Brand Direct
Advantage MasterCard, Checks and Approved P.O.s are Accepted Prices and specifications
subject to change.



PCM 91-48

LAPTOPS

ALR 386SX 20MB	2499
ALTIMA NSX 386SX/20MB	2849
386SX 40MB/80MB	2799/3199
AST 286/20/40MB	2199/2499
386SX/20/40MB	2599/2899
LEADING EDGE	
386SX 40MB VGA 1MB/2MB	1829/1929
MITSUBISHI	
MP286L 20MB EGA 640K/2.6MB	1649/1999
MP286L 40MB EGA 640K/2.6MB	2149/2499
2400 Model/Carry Case+MS Works Add200	
NEC UltraLite 386V/20MB/40MB	CALL
ProSpeed 286 40MB 1MB/2MB	2979/3179
286-100MB/1/2/5MB	3569/3769/4169
386SX 40MB 1/2/5MB	3349/3549/3949
386SX 100MB 1/2/5MB	3699/3899/4299
386-40MB/2/4/6MB	3895/4195/4595
386-100MB/2/4/6MB	4499/4799/5099
386CSX Color 40MB/100MB	5095/5895
PANASONIC CF-150B w/carry case	599
POCKET PC 8088 under 1lb	949
Accessories/ROM cards	CALL
SHARP PC 6220-20MB/1/2MB	2479/2649
TEXAS INSTRUMENTS	
TM2000 286/20MB 1/2/3MB	2449/2599/2799
TM3000 386SX/40/60MB	3749/3949
TOSHIBA	
T1000 w/1200 Modem	899
T1000SE 1MB/3MB	949/1199
T1000XE 1MB/3MB	1349/1599
T1000LE 20MB 1/3/5MB	1549/1799/2049
T1200XE 1MB/3MB	1969/2099
T2000SX 20MB 1/3/5MB	3049/3299/3549
T2000SX 40MB 1/3/5MB	3349/3599/3849
T3000SX 80MB 1/3MB	3699/3799
T3200SX 100MB 1/3MB	3069/3199
T3200SX 120MB 1/3MB	3699/3799
T5200-100MB/2/4/6MB	4799/4949/5099
T5200-200MB/2/4/6MB	5299/5449/5599

FREE SHIPPING

PREPAID orders only (by check) with UPS Ground to 48 contiguous states. Some heavy items such as monitors & printers may not be free. Allow 2-3 weeks for personal & company checks. Cashier check orders shipped immediately.

REFER AD#PC 825

MEMORY UPGRADES

COMPAQ	
LT2 286 1MB/4MB	165/599
LTE 286 1MB/2MB	139/169
HEWLETT PACKARD: Specify Model	
1MB/2MB/4MB	95/129/199
LEADING EDGE LT 386SX 1MB	129
MITSUBISHI/NEC Laptops	CALL
SHARP PS220 1MB	179
TEXAS INST TM2000 1MB	179
TOSHIBA T1000 768K Card	249
T1000SE/XE/LE 2MB	269
T1000LE 4MB/8MB	549/999
T1200XE/1600 2MB	159
T2000SX/2/4/6MB	269/549/999
T3100E/T5100 2MB	199
T3100SX 2MB ea/4MB ea	149/399
T3200SX 2MB ea/4MB ea	149/399
T5100 2MB/T3200 3MB	199/299
T5200 2MB ea/8MB ea	149/799

MATH CO.

SIMMS SIPS 1MBx9 60/70/80	CALL
4MBx9 60/70/80	CALL
CYRIX 83087-16/20	259/289
83087-25/33	359/439
INTEL 80287 XL/80C287A	195/279
80387SX/16/20	289/309
80387DX 16/20	329/359
80387DX 25/33	479/559

DISPLAY CARDS

Color or Mono Graphics w/Par port	49
ATI VGA Wonder Plus w/512k	235
HERCULES Graphics Sx 111 629/929	
NEC Graphics Engine 1B	599
Graphics Engine 256	899
NUMBER 9 GrafX Xcel. Lvl 1	599
G X Level 2-5 XT/PS2	CALL
Pepper 321 Plus	1399
PepperPro 1024/256	1599
PepperPro 1280/32	2199
ORCHID ProDesigner II 1MB	325
SMDA DSGN VGA Legend 1MB	349
VIDEO-7 VGA 1024/512k	229
V-RAM VGA 512K	349

POLICY: Prices & availability subject to change. Prices reflect discount for cash payment. Add 3% (Min \$5) for COD. DISCOVER, MC, VISA and 5% for Amex. All sales final. Not responsible for compatibility. Refused shipments subject to 20% charge (Min \$50). CREDIT CARDS NOT CHARGED UNTIL SHIPPED.

MODEMS

EVEREX 2400 MNP5 Int/Ext	159/199
EXCEL 2400 Int/Ext	75/95
INTEL 2400 MNP5 Int/Ext	189/229
9600 V42 Ext w/SW	499
MEGAHERTZ 2400 Int w/software	
Compac LITE/SLT	159/165
Toshiba In slot/No slot	139/135
NEC ProSpeed	149
Zenith 181, 183, SP SP286	149
MITSUBISHI LP 2400 Int	149
PRACTICAL PERIPHERALS	
2400 Mini Pocket	129
2400 MNP5 Int/Ext	189/199
PROMETHEUS	
9600 MNP5 V32 Ext	649
2400 MNP5 Int/Ext	179/199
TELEBIT	CALL
TOSHIBA 1200 Int/T1000	65
2400 In slot/No slot	219/249
UDS/Motorola All Models	CALL
US ROBOTICS	
Courier 2400 MNP5 Int/Ext	279/315
HST 14.4 V42bis Int/Ext	499/535
9600 V32 MNP5 Int/Ext	519/569
HST V42 Dual Std Int/Ext	759/799
WORLD PORT 2400 Portable	239
2400 MNP5 Portable	339
2405 MNP5 Toshiba No slot	299
ZOOM 2400 Int/Ext	89/99
2400S Int w SendFax	99

MONITORS

CORNERSTONE Dual Page	
19" 19" Non Glare	1749/1949
Grey / 4:1/16 level	1899/2399
MITSUBISHI 1361 14	499
NEC 24" SVGA	449
40" 16" SVGA	979
PANASONIC C1361 14	469
21" 15" w/adaptor	1149
PRINCETON GRAPHICS Ultra	
12" 14" 16"	479/529/559
SEIKO 1450 14" SVGA	649
SONY 1304 14" SVGA	649

BACKUP & DRIVES

ARCHIVE	
40MB XL w/ape Int/Ext	259/399
80MB XL w/ape Int/Ext	375/485
COLORADO JUMBO Backup	
120MB w/ape Int/Ext	269/379
250MB w/ape Int/Ext	349/459
CORE Tape Light 300MB	
Int w/ape: XT/PS2	379/399
Ext w/ape: XT/PS2	519/529
MAYNARD MaynStream	CALL
MOUNTAIN 152MB w/Mach II In	649
EXTERNAL FLOPPY & Controller	
FOR PC / XT / AT / 386	
3.5": 1.44MB	189
5.25": 1.2MB	195
FLOPPY 1.25" EXT 300K / 1.2MB	
IBM PS/2: Most Models	179
COMPAQ LITE/SLT	179/185
MITSUBISHI 286L	179
NEC ProSpd 286/386SX	179
TOSHIBA Most Models	179
ZENITH SupersPort 286	179
HARD DRIVES: EXTERNAL	
Portable 20MB under 1lb	599
40/100/200MB	529/799/1599
PLUS HC II XL/50MB/105MB	365/629
Impulse 40/80	339/499

SCANNERS

CHINON DS 3000	545
DS 3000 w/OCR SW ReadRight	695
COMPLETE PC Full page	499
DEBT Personal Scan w/OCR	679
PC 3000 Solution Pac	1499
HP ScanJet Plus: Specify I/F	1399
ScanMan+ XT/AT/PS2	189
ScanMan Plus: PS2 50 & up	249
MICROTEK 300G/XT or PS2	1199
300Z Color/GS XT/PS2	1699
PANASONIC RS 505U/505U756/996	
Interface 505A/506: XT/PS2	229/329
RS 307U	969
Interface for 307U: XT/PS2	349/429
SHARP JX 100/JX 300	CALL

FAX, etc.

AUDIOVOX 110/220 volt 50/60 Hz	
1000/2000/3000	379/449/549
SAMSUNG 1010/1100	399/429
1010/2310	469/589
SHARP 120/215	449/499
230/334	569/699
COMBO 2400 Modem & 9600 Fax	165
COMPLETE PC Fax 9600 Int/Port	289/295
Complete Communicator: Modem, Fax & Voice Mail System	395
EVEREX 2496: Fax & MNP5 Data Modem	
Internal / External	249/319
FRECOM Fax 96	165
INTEL SatisFaxion 9624	385
R & D 2496 Fax/Modem	
Int for Toshiba with MNP5	379
WORLD PORT 2496 Portable	439
Toshiba No slot/In slot	399/449

PRINTERS

CANON BJ10e	309
DICOMIX 150 Plus Parallel	309
With 3.6" or 10" cable	325
IBM ProPrinter II/XL	285/345
HEWLETT PACKARD DeskJet 500	479
PanJet/PanJet XL	1089/1849
HP IIPI/IIIP/IIID	CALL
TEXAS INSTRUMENTS PS17	1395

NETWORKING

DCA IRMA Full Line	CALL
STD MICRO Arnet Hub: Act/Pass	299/779
Arnet Intell. Hub: Coax/Twin Pair	479/589
Coax PC 130/PS110	119/369
SYNOPTICS Full Line	CALL
TIARA Arnet Hub: Active/Passive	CALL/49
Arnet Larcand/A: 8 bit/16 bit	89/249
Ethernet Larcand/E: 8 bit/16 bit	189/329
WESTERN DIGITAL Ethercard plus	
8 bit with 8k / 32k	179/199
16 bit / 16 bit MCA	249/279
XIRCOM Pocket Adapters	CALL

FOREIGN ORDERS

FAST and reliable. Door to Door. Fully insured. Most countries 3-5 days service. Low shipping charges. Major Credit Cards accepted. Fax 714-272-9201.

- Manufacturer direct memory upgrades - low pricing
- Technical Sales - upgrade assistance
- Factory (five year) warranty
- 1 stop source for all PC memory upgrades

MEMORY SHOPPER

CALL TOLL FREE
1-800 255 8607
for latest pricing

SIMMS	DRAMs
256K x 8 - 12	10 64K x 1 - 12 1.60
256K x 8 - 10	12 64K x 1 - 10 1.45
256K x 8 - 08	15
256K x 9 - 12	13 256K x 1 - 12 1.65
256K x 9 - 10	15 256K x 1 - 10 1.85
256K x 9 - 08	18 256K x 1 - 80 1.95
1M x 8 - 10	35 64K x 4 - 10 1.85
1M x 8 - 08	39 64K x 4 - 80 1.95
1M x 8 - 10	41 1M x 1 - 12 4.45
1M x 9 - 08	45 1M x 1 - 10 4.75
1M x 9 - 07	54 1M x 1 - 80 4.95
4M x 8 - 08	325 1M x 1 - 70 5.25
4M x 9 - 08	365 256K x 4 - 10 4.75
	256K x 4 - 80 4.95
	1M x 4 - 80 Call
	4M x 1 - 80 Call

CO PROCESSORS				
8087	8088	8089	108MHz	
INTEL	\$ 75	\$109	\$153	
80287	80288	80289	108MHz	20MHz
INTEL	\$118	\$179	\$189	\$261
XT/PS2		\$171	\$194	\$224
				\$250
AMD	SPECIAL	\$95	SPECIAL	
80387				
108MHz	20MHz	25MHz	33MHz	50MHz
INTEL				
\$209	\$340	\$449	\$649	\$790
				Can
XT/PS2				
\$215	\$312	\$382	\$472	\$790
				\$322

COMPAQ MEMORY	
DeskPro 286S 386/20/20E/25/316	
1MB Add on module	\$ 95
4MB Add on module	\$329
1MB Exp Bd (20E 25S only)	\$155
4MB Exp Bd (20E 25S only)	\$388
DeskPro 286N 386N/SX/20	
1MB SIMM	\$ 85
2MB SIMM (not 286N)	\$139
4MB SIMM	\$395
Call for expansion cards for 286/386N	
DeskPro 386/33, 486/25/33 and SystemPro	
2MB Bd	\$ 195
8MB Bd	\$ 990
32MB Dual Bd	\$6550
DeskPro 386/16	
1MB Kit	\$ 148
1MB Bd	\$ 275
2MB Bd	\$ 422
4MB Bd	\$ 655
8MB Bd	\$1140
Portable 386	
1MB	\$225
4MB	\$685
LTE/286	
1MB	\$120
2MB	\$190
4MB	\$712
LTE/386	
1MB	\$140
SLT/286	
1MB	\$170
4MB	\$715
SLT/386	
1MB	\$185
2MB	\$329
4MB	\$715
Call for upgrades on Portable II & III	

Call for upgrades on Portable II & III

HP LASERJET VECTRA MEMORY	
HP LaserJet II/III/IIIPI/IIIPII	
1MB \$ 90	4MB \$218
2MB \$139	
Call for zero memory boards	
Vectra QS/20 RS/25 20C QS/16 ES/12	
1MB Kit	\$99
2MB Kit (QS/16, ES/12 only)	\$159
4MB Kit	\$315
Vectra 386/25 PC, 486PC	
1MB	\$88
2MB	\$139
4MB	\$379
8MB	\$799

IBM PS/2 MEMORY	
Model 30/286	
512KB	\$ 46
1MB	\$155
Model 70 E61/121, 502, 558X 85SX, 70A21	
1MB (not 70A21)	\$ 88
2MB	\$139
4MB (only 55/85SX Boards)	\$395
Model 80	
1MB (80-141)	\$125
2MB (80-111/311)	\$215
4MB (80-A21/A31)	\$915
Expansion Boards 50, 55x 80 & 65SX	
2-4 MB W/2MB	\$550
All models 70 & 80	
2-16MB W/2MB	\$480
2-14MB W/2MB	\$515
4-16MB W/4MB	\$815
NEW - Model 90/95	
2MB	\$215
4MB	\$495

IBM EXPANSION BOARDS	
Call for full range of	
Boca Intel Orchid	
Boards to suit PC, XT, AT and PS/2 using standard RAM or SIMM upgrades	
Eg Everex RAM 8000 W/2MB	\$550
RAM 3088 W/1MB	\$285
HP FONT CARTRIDGES	
Standard - A thru Z	\$99
125 - 150 Fonts	\$229
Postscript for HP HD HP III	\$349
Best selling Postscript emulation cartridge	
Our fonts are 100% compatible with HP Main selling point: instant installation. Call for Main	

ZENITH	
TurboSport 386e	
1MB	\$199
4MB	\$479
SuperSport SX (Alpha/Beta/286/286E)	
2MB	\$269
2386/2D/25/33/33E	
1MB	\$ 99
2MB (not 33E)	\$199
4MB	\$399
TOSHIBA MEMORY	
T1000 SE/XE	
1MB	\$259
2MB	\$339
T1200XE T1600 T3100/SX T3200SX	
T5100 T5200	
2MB	\$199
4MB	\$459
Custom Memory upgrades	

AST MEMORY	
Premium W/286/386SX	
Bravo/286/386SX	
512K Kit	\$ 55
2MB Kit	\$108
Premium 386/C/16	
1MB Kit	\$ 95
4MB Kit	\$349
Premium 386/33/SX-16, 486/25/33	
1MB	\$80
Premium 386/SX/20/SX16	
1MB	\$ 90
4MB	\$535
Premium 386/33T, 486/25	
6MB	\$975
Premium 486 2MB	\$184
Full range of upgrades for AST available	
	

APPLE MEMORY	
MAC SE SE 30, II IICx, IICx	
1MB Kit	\$7
2MB Kit	\$9
MAC IICx, IICx	
4MB	\$ 26
16MB (special IICx call)	\$128
(memory management S/W available for 16MB kits)	
NTX Laserwriter	
1MB	\$125
4MB	\$315
MAC Portable	
1MB	\$ 26
2MB	\$ 44
3MB	\$104
4MB	\$124
Call for information on latest models MAC Classic	

PC Magazine says "...Arlington offers worry-free mail order purchasing at reasonable rates!"

IBM PERSONAL SYSTEM II

Model 30, 286, 40 MB, w/Monitor	\$1899
Model 55SX, w/60 MB w/Monitor	\$2799
Port. 70/120	\$5695
Model 70, w/60 MB and Monitor	\$2999
Model 70, w/121 MB and Monitor	\$3799
Model 70-A21, w/121 MB and Monitor	\$4999
6 Month Warranty	

COMPAQ 286N

(12MHz) 40MB, 1MG Memory,
Mono VGA Card & Monitor

COMPAQ PORTABLES

LTE 20	\$1949
LTE 286 20/40	\$2499/\$2849
SLT 386 S/20-60 MB	\$4749

COMPAQ 386

Model 386S MOD I	\$1799
Model 386S w/40 MB (16 MHZ)	\$2199
Model 386E w/40 MB (20 MHZ)	\$2995
Model 386E w/100 MB	\$3195
Model 386 25E w/100 MB	\$4599
Model 386-33 w/84 MB	\$6999
6 Month Warranty	

BRAND NAME COMPUTERS

286E, 12 MHz, 1 MG Memory, 40MG
Drive, Mono Card & Monitor

386SX, 16 MHz, 1MG, 40MG,
Mono Card & Monitor

386E, 20 MHz, 1MG, 40MG,
Mono Card & Monitor

PANASONIC

FX1925 — 386SX, 40 MG,
VGA color monitor

NOTEBOOKS

CF170 Notebook 6.1 lbs.,
10 MHz, 20 MB

AST PREMIUM

286 — 512K, 40 MB,
mono monitor

MODEMS

Hayes 1200/2400 Ext \$279/329
V-Series 9600 Int. \$549
Intel 2400

CHIPS

64K Ram Chips 9 for \$20
256K/1 MG Chips . each \$4/\$7
256K/1MB Simms \$40/\$69
Compaq 386 1 MB

intel

Intel 8087-3

MULTIFUNCTION BOARDS

AST 6 Pack w/384K

INTEL

Intel Above Board+

SCAN. & DIGIT.

Panasonic FXRS 3070U

DRIVES & TAPES

Ext. 5 1/4" for PSII

SEAGATE HARD DISKS

20 MB for XT (ST225)

IOMEGA

20 MB Int. w/boot card

PLUS

Hard Card 20 MB

CONNOR HARD DRIVES

40 MB/100 MB

PRINTERS

EPSON

VERY COMPETITIVE PRICES!!

LX810

OKIDATA

ML320

CITIZEN

120D

PANASONIC GREAT PRICES!!!

1123

HEWLETT-PACKARD

Laserjet III w/Toner

NETWORKING

Advanced Network 2.15

SOFTWARE

D Base III Plus

VIDEO BOARDS

ATI 16 Basic

MONITORS

MITSUBISHI

EGA

NEC

Multisync IIA

PANASONIC

1381 VGA 1024x768

GOLDSTAR

Color/EGA

CIRCLE 336 ON READER SERVICE CARD

Arlington
Computer
Products, Inc.

Defective software will be replaced with
the same item only. We cannot guarantee
satisfaction. Please return defective items
within 30 days of purchase. Please send
return shipping label to:

HOURS C.S.T.
8 am - 5:30 pm - Mon.-Fri.
9 am - 5 pm - Sat.
1970 CARBOY
MT. PROSPECT, IL 60056

800-548-5105

CUSTOMER SERVICE 708-228-6333

SHIPPING 708-228-9748

TECHNICAL ASSISTANCE 708-228-1470

FAX 708-228-0516

No surcharge for MasterCard or Visa.

PC

MAGAZINE

EDITORS' CHOICE

June 27, 1989
Mass Storage Mail Order

HARD DRIVES



PC/XT Kits

KALOK

KL320 40ms **\$189**
KL330 40ms **\$219**

(Available in AT kit only)
40Mb \$249
KL343 28ms IDE 16 bit hard/
floppy controller with adaptor.

Each kit includes drive, cables, controller, How-To manual and mounting hardware

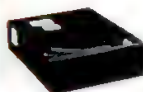
Card DriveTM



Card Drive 20 KL320 40ms **\$239**
Card Drive 30 KL330 40ms **\$259**
Card Drive 50 ST157R 28ms **\$339**
Card Drive 65 MK134 22ms **\$399**

Card Drives use quality Kalok, Minscribe, Seagate or Toshiba hard drives, with controller and cables mounted onto a sturdy metal frame. Pre-tested and pre-formatted. Card Drives are available for IBM PC/XT, compatibles and most Tandy models.
SUPER EASY INSTALLATION!

MITSUBISHI 44Mb



- 25ms
- MFM
- Rotary Voice Coil!

\$299

Includes 5 1/4" half-height drive, Installation Manual, mounting hardware and partitioning/formatting software

MR535

CONNER

Performance Kits

40Mb CP3044 25ms **\$299**
80Mb CP3184 25ms **\$499**
104Mb CP3104 25ms **\$529**
209Mb CP3204 16ms **\$899**

YOU GET - 16 bit Hard/Floppy controller • IDE interface embedded PC/AT controller • Disk Manager formatting software • "1 to 1" Interleave • 32K or 64K "Look Ahead" read buffer • 50G's non-operating shock • Dual Cables • Mounting frame • Grey and Black Bezels

TOSHIBA

FLOPPY DRIVES

	Toshiba	TEAC
360K	\$54	\$59
720K	\$59	\$64
1.2Mb	\$69	\$74
1.44Mb	\$69	\$74

65Mb

RLL • 22ms 3 1/2" • HH

Bare Drive **\$319**
IBM PC/XT KIT **\$369**
IBM AT KIT **\$399**

Kits include controller, cables, mounting hardware, partitioning, formatting software and installation manuals.

MK234FCH

104Mb

IDE • 22ms 5 1/4" • FH

\$499

IBM 16 bit KIT

Includes 16 bit host adaptor, beige & black bezels, rails, cables, software & manual.

UNLIMITED
TOLL-FREE
TECHNICAL
SUPPORT

TAPE BACKUP



COLORADO MEMORY SYSTEMS INC.
60Mb/120Mb
With data compression
\$249

Seagate

40Mb

ST251-1 **\$239**
• 28ms MFM

IMPRIMIS

A Part of Seagate Technology
80Mb

ST296N **\$329**
• 28ms SCSI

All bare drives.

	Internal	External
CHINON	\$449	\$599
TOSHIBA	\$629	\$749
PACKARD BELL	N/A	\$599

YOUR OPTICAL EXPERTS
EVERYTHING YOU NEED

- ☐ WORM
- ☐ REWRITABLE
- ☐ CD ROM
- ☐ JUKEBOXES

You name it, we have it, can ship it, and support it!

CD ROM-OPTICAL

MICROPOLIS

160Mb MC1654

16ms Half-Height **\$995**

340Mb MC1664

14ms Half-Height **\$1545**

660Mb MC1568

16ms Full-Height **\$2095**

1 (SCSI Only) Gigabyte MC1598

14ms Full-Height **\$2895**

High Capacity Drives ESDI or SCSI PC PAKS

Each PC PAK comes COMPLETE with ESDI Controller for dual floppy/dual hard drives. All kits include cables, mounting hardware, installation software and our comprehensive Installation Manual. Network drivers available. SCSI versions are available at equivalent prices.

HARD DRIVES

International



1912 West Fourth St.
Dept. JA
Tempe, AZ 85281
Sales: (602) 350-1128



U.S. and Canada
(800) 767-DISC
Order Status: (800) 729-4490
FAX: (602) 350-9193

PURCHASE ORDERS
Corporate • Government
Institutional

APO/FPO
602-350-1135

International
Sales: (602) 350-1144
FAX: (602) 921-8312

Sales: (800) 733-0882
FAX: (602) 350-1180

Visa & MasterCard for VISA & MC



Prices and availability subject to change without notice. All items are NEW. P.O.'s accepted from qualified buyers. Net 20 (some conditions may apply). Add \$13 shipping for EXPRESS APO/FPO orders. 30 Day Guarantee conditions: shipping & handling charge (not refundable); product must be undamaged and in original condition. 1 Year Replacement Policy may have some restrictions. Hard Drives International is a division of Insight Distribution Network, Inc. All trademarks are the property of their respective owners.

Worry-Free
30
Day
GUARANTEE

JA022691

DON'T PAY MORE DON'T SETTLE FOR LESS!

- With 14 warehouses nationwide, your order arrives next day!
- Over \$50,000,000 in stock.
- More than 6,000 hardware and software items in stock.



- Same-Day shipping until 3:00pm in your time-zone- nationwide!
- No charge for credit card use.
- No percentage charge for Shipping & Handling.

LOWEST PRICES ON SOFTWARE

ACCOUNTING		INTEGRATED	
DAC Easy Accounting V4.1	79	Microsoft WORKS V2.0	92
DAC Bonus Pack V4.1	125	PFS:First Choice Prodigy	83
Peachtree Complete III	139	Q&A V3.0	229
Peachtree Double Bonus	209		
TimeSlips III V4.0	185		

CAD/ENGINEERING

Autosketch V2.0	85
Generic CADD Level 3 V1.1213	
DesignCAD V3.0 3D	188

COMMUNICATIONS

Crosstalk XVI V3.1	103
ProComm Plus V1.1B	61

DATABASE

Clipper 5.0	499
dBase IV V1.1	459
DBXL V1.3R	132
Paradox V3.5	479

DESKTOP PUBLISHING

Pagemaker V3.01	475
Ventura Pub. V3.0 Gold	479
Express Publisher V2.0	89
PFS FirstPub V3.0	85

EDUCATIONAL

Microsoft Learning DOS V2.0	33
PC GLOBE 4.0	42
Microsoft Flight Simulator 4.0	39

FINANCE

Quicken V4.0	37
Managing Your Money V6.0	112
Wealthbuilder	132

Famous Maker!



386SX, 40MB Laptop

Includes 1-Year On-Site by General Electric!

FORMS

Formwork with Fill & File	79
Formtool Gold V3.0	55
PerFORM V2.1	79

GRAPHICS

Adobe Illustrator 4.0	325
Corel Draw V2.0	349
Designer V3.0	435
Harvard Graphics V2.3	295

OPERATING ENVIRONMENTS

Desqview 386 V2.2	110
Microsoft Windows V3.0	89
Toolbook for Windows	279

PROGRAMMING

Turbo C++ Pro	189
Turbo Pascal V5	95
Microsoft Quick Basic V4.5	61
Microsoft Quick C V2.5	61

PROJECT

Microsoft Project V4.0	299
Harvard Project Mgr 3.01	399
Timeline V4.0	439

SPREADSHEETS

LUCID 3.0 V2.0	54
Microsoft PC Excel 2.1	295
Quattro Professional V2.0	299
SuperCalc 5	289

**MICROSOFT
WINDOWS 3.0**
\$89

UTILITIES

BackUp	
BACK IT 4	69
Fastback Plus V2.1	105
Norton Backup	89
PC Fastback Plus	47
General	
Copy 1 PC V5	22
Mace Vaccine	56
Norton Editor V1.3C	45

Hard Disk	
CheckIt V2.1	79
Disk Optimizer V4.05	37
Mace Utilities V1990	84
Norton Jit. Adv V5.0	110
Disk Technician Adv V6.0	89
PC Tools V6.0	85
Spartan II V1.1	67

Laptop	
Battery Watch V2.0	27
Brooklyn Bridge V3.0	79
LAP LINK V3.0A	85

Memory	
AboveMem	39
PopDrop Plus	55
QEMM V5.1	53

Menu	
Direct Access V5.0	58
XTREE Pro Gold V2.0	59

OCR	
ReadRight V2.01	329
ReadRight Personal	165

PLEASE LOOK FOR OUR LATEST PRICE REDUCTIONS IN BOLD TYPE!

Print	Floppy - Toshiba Kits
GoScript Plus V3.0	175
PrintQ V4.0	71
Sideways V3.2	40
UltraScript PC 2.0	125

WORD PROCESSING

Microsoft WORD V5.5	209
WORD for Windows	299
RightWriter V3.1	49
AMI Professional V1.2	289
PFS Pro Write & File	159
Volkswriter4	99
WordPerfect V5.1	245

COMPUTERS

ALR BusinessVEISA	
386/33 Model 101	1679
486/25 Model 101	2999
486/33 Model 101	3299
PowerLite 386SX Model 101	999

Call For The LOWEST PRICES
On NAME-BRAND Laptops!

ALR 386/33 BusinessVEISA



\$1679
Model 101

CO-PROCESSORS

INTEL 80287 XL	189
INTEL 80387 SX 16MHz	285
INTEL 80387 SX 20MHz	309
INTEL 80387-20	385
INTEL 80387-25	459
INTEL 80387-33	559

DRIVES

CD-ROM	
NEC CDR-35-01	399
NEC CDR-72 EXT	679
NEC CDR SCSI Adapter	139
SONY CDU-5311	359

**PLUS
HARDCARD II XL
50MB
\$399**

Hard Cards

Plus Development - 9ms!	
Hardcard II XL 50MB	399
Hardcard II XL 105MB	649
Internal - Seagate	
ST251 1 40MB Drive	249
ST157A 40MB IDE	249
ST1102A 80MB IDE	419
ST1144A 100MB IDE	469

Internal - Micropolis	
182MB HH PC PAK	999
385MB HH PC PAK	1499

Tape BackUp	
Colorado Basic Jumbo	249
CORE Tape Light 300MB	529

FAX CARDS

Complete Fax 9600	299
Hayes JT Fax 4800B Int	199

GRAPHIC CARDS

ATI	
VGA Wonder Plus 512K	219
8514 Ultra 512K	599
Boca	
Super VGA (800x600, 1024 VGA)	99
1024 VGA	129
Hercules	
Hercules Gph Card Plus	175
Graphics Station 1MB	649
NEC	
Graphics Engine 16	595
Graphics Engine 256	889
Video 7	
VGA 1024i 256K	219
Fast Write VGA	279
V-RAM VGA 512K	349

KEYBOARDS

Switchboard - Datadesk	145
KB-3270 PC - Keytronics	149
KB-101 Plus - Keytronics	86

LOWEST PRICES ON HARDWARE

MEDIA	POWER PRODUCTS
Beroun 5 25' 40mb 3 PK	219
SONY 3 1/2" DS DD 10PK	13
SONY 3 1/2" DS HD 10PK	22
3M 3 1/2" DS HD 10 PK	19
3M 5 1/4" DS DD RH 10 PK	7
3M 5 1/4" DS HD 10 PK	12
American Power - UPS	
200VA UPS	149
450AT UPS	269
Master Pace Plus	95
Master Pace Remote	103
Trappitt SOBARA 6	39 49

MEMORY BOARDS

BocaRam AT PLUS	109
Everex Ram 3000 Deluxe	85
Above Bd Plus 2MB	549

MODEMS

ATI 2400 ETC Int w/MNP5	165
ATI 9600 ETC External	499
CPI	
CPI 2400S Internal	67
CPI VIVA 24 External	99
CPI VIVA 24 Ext w/MNP5	139
Everex	
Evercom 2400 Int	109
Evercom 24 Int MNP	145
US Robotics - Dual Standard	
CompuLink 9600	769

**OKILASER 400
4 pages /Min.
\$649**

MOUSE PRODUCTS

Logitech	
Dexxa Serial DLX	29
Series 9 Ser Bus	65 74
Trackman Ser Bus	75 81
Microsoft - Serial or Bus!	
Microsoft Mouse	85
Mouse w/ Menu & Paint	109
Mouse w/ Windows 3.0	145

MONITORS

Magnavox	
78M623 TTL Amber	89
78M749 VGA Mono	139
CM3032 VGA Color	299
Super VGA Color	399
Mitsubishi	
XC1429 VGA Color	389
Diamond Scan 14"	489
NEC	
MJL TISYNIC 2A	465
MJL TISYNIC 3D	659
MJL TISYNIC 4D	1149
MJL TISYNIC GS 2A	209
Samtron - made by Samsung	
AMBER 14" Flat M430	99
CGA 14" Color SC452C	199
VGA II 14" Color	349

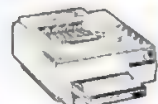
NETWORK CARDS

NE 1000-A Ethernet-8 Bit	145
NE 2000-A Ethernet-16 Bit	175
SMC ArcNet 8-Bit	89

PRINTERS

Canon	
LBP-4 LASER	899
LBP-8 MARK III	1449
LBP-8 MARK IIIIT	1899
RAM Board A 1MB	249
Kodak	
Diconix 150 PLUS - Par	339

NEC Silentwriter2 Model 90 Postscript Laser



\$1599

NEC	
P2200XE 80 Col/24 pin	259
P6200 80 Col/24 pin	489
P6300 136 Col/24 pin	659
NEC SilentWriter PostScript Lasers	
Model 90 - 4ppm	1599
Model 290 - 8ppm	2549
Okidata	
ML 320P 9 pin	329
ML 321P 9 pin	459
ML 380 24 pin	299
ML 393 Plus 24 pin	999
OKLASER 400	649

Panasonic	
KX P1180	169
KX P1124	269
KX P1624	339
KX P4420 Laser	799
QMS	
PS 410 Postscript Laser	1999
PS 820 Postscript Laser	3599

PRINTER ENHANCEMENTS

Computer Peripherals	
JetFont Superscript	255
JetPage ID IIP III	319
JetMemory 1MB P II	165
Pacific Data for HP IID IIP III	
4 Memory 1MB	129
PacificPage 4 0	359
Plotter in A Cart	239

Our Policy:

- We accept VISA & MasterCard only.
- Your card is not charged until we ship.
- We ship via UPS and Federal Express.
- Freight charges are based on weight: \$6.75 min.
- 30 Day return privileges. All items must be "as new" and complete. Sorry, we cannot accept incomplete items for return.
- Technical Support 800-942-0838 - Customers Only!
- All items subject to availability.
- Prices subject to change without notice.

Ad Code: PC924

Micro National Express
800-879-4001



Orderline Hours Monday - Saturday 7 a.m. to 7 p.m. (CST)
CIRCLE 30 ON READER SERVICE CARD

SHIPPING LOCATIONS: ATLANTA • CHICAGO • DALLAS • LOS ANGELES • NEW YORK • SAN FRANCISCO • SEATTLE • TAMPA • WASHINGTON, D.C.

Copyright Micro National, Inc. 1990 Micro National Express is a registered trademark of Micro National, Inc. Birmingham, AL. Train logo is a registered trademark of Micro National, Inc.

PRODUCT CATEGORIES

HARDWARE

Add-On-Boards	437
CD-ROM	437
Communications	437
Computer Systems	438
Diskettes	440
Disk Drives	440
Expansion Units	441
Printers	441
Tape Drive Subsystems	442

SOFTWARE

Construction	444	Mailing Programs	447	Utilities	451
Data Base	444	Music	448	Windows	451
Data Entry	445	Preventative Maintenance	448	Word Processing	451
Desktop Publishing	445	Programmers Tools	448		
Diagnostic	445	Public Domain/Shareware	448		
Education	445	Real Estate	448		
Engineering	445	Religion	449		
Entertainment/Games	445	Sales Marketing	449		
Financial	446	Security	450		
Flowcharting	446	Statistics	450		
Foreign Languages	446	Surveys	450		
Graphics	447	Taxes	450		
Inventory	447				

MISCELLANEOUS

Accessories	451
Bar Coding	451
Books/Catalogues/Publications/	453
Data Conversion	453
Data Recovery Services	453
Disk Conversion	454
Diskette Copy Services	454
Insurance	454
Supplies	454

SOFTWARE

Accounting	443
Business	444
Communications	444

ADVERTISING INFORMATION

PC MAGAZINE MARKETPLACE, 3rd FLOOR, ONE PARK AVENUE, NEW YORK, NY, 10016

■ PC Magazine Marketplace is a special economical section designed to bring together buyers and sellers in the IBM standard market.

■ The section directs buyers to their best product and service solutions by grouping all listings by category.

■ Advertisers may select the most appropriate advertising options as ads are sold by the column inch. Second color is also available.

■ Standard Directory Listings are also available and require a 4 issue minimum.

■ FOR MORE INFORMATION CALL 212-503-5115 OR

1-800-825-4ADS

■ ADVERTISING ACCOUNT MANAGERS

Sr. Account Manager,
Kathleen Morris 212-503-5125
 AR, CA 209, 707, 916, CT, IL, MI, MO, NH, NJ, NM, NV, OR, WA

Charles Boyar 212-503-5118
 AL, CA 415, 818, FL, GA, ID, KS, VT

Karen Cosgrove 212-503-5156
 CA 619, 714, 805, IA, IN, LA, TN, TX, WI, WY, OVERSEAS

Kevin Downey 212-503-5176
 CA 213, DC, MS, NC, SC, UT, VA, WV

C. Wesley Walton 212-503-5117
 CA 408, DE, HI, KY, MD, ME, MT, NE, MN, OK

Jelane Westra 212-503-5175
 AK, AZ, CO, MA, ND, NY, OH, PA, RI, SD, CANADA

■ NATIONAL ADVERTISING STAFF

Director, Classified Sales,
 Paul Stafford

Group Advertising Director,
 Kathryn J. Cumberlander

Sales Manager,
 Vickie L. Pinsky

Support Manager,
 Monica B. Dixon

Sr. Advertising Coordinator,
 Wanda D. Brown

Production Director,
 Anne Brockinton

Production Manager,
 Carolyn Bingham

Production Supervisor,
 Bessi Dion

HARDWARE/ADD-ON-BOARDS

MEMORY UPGRADES

IBM PS/1, PS/2 & LaserPrinter

512Kb, 2Mb Upgrades CALL
PS/1's
2Mb Module Model 80's CALL
Model 70-E61-121 \$185
2-8Mb Exp Boards CALL
Models 50, 60, 70 & 80
1, 2, 3.5Mb Memory Upgrades CALL
LaserPrinter 4019, 4019e

IBM PS/2 Upgrade

386™SX™ Processor Upgrade
Models 50 & 60 CALL
IBM RISC 6000 Memory
16Mb Upgrade Kit CALL
32Mb Upgrade Kit CALL
64Mb Upgrade Kit CALL
RISC 6000 Models 320, 530, 550

COMPAQ Memory

1Mb Add-On Module \$153
4Mb Add-On Module \$387
DeskPro 386/20, 25, 20e, 25e
2, 8Mb Add-On Modules CALL
DeskPro 486/25, 386/33, SystemPro
1, 2, 4Mb Memory Modules CALL
LTE286, LTE386s/20
SLT286, SLT386s/20

Toshiba Laptops

2Mb Upgrades \$240
Models 1800, 3100e, 3100SX, 3200SX,
5100, 5200

1, 2Mb Upgrades CALL
Models 1000SE, 1000XE

HP LaserJet Memory

For Models II, IID, IIP, III, IIID CALL



SIGMA DATA

Scituateville Row • P.O. Box 1790 • New London NH 03257
Established 1986 NH (603) 526-6909 FAX (603) 526-6915

TOLL FREE

800-446-4525

5-YEAR WARRANTY! • 30-DAY MONEY BACK GUARANTEE

IMMEDIATE DELIVERY! • 24-HOUR REPLACEMENT

VISA, MC, AMEX, COD. Qualified PO's

CIRCLE 751 ON READER SERVICE CARD

The 20/SX has Arrived..

Dual Floppy

Controller

IDE Hard-Drive
Interface



2 Serial Ports

1 Parallel Ports

Phoenix Bios

Expand to 8Mb

	Base	40Mb IDE	80Mb IDE
BASIC 20/SX SYSTEM	\$ 899	\$1199	\$1499
BASIC 16/SX SYSTEM	\$ 729	\$ 999	\$1299

SYSTEMS INCLUDE:

1MB Memory
1.2Mb Floppy

Mini Tower Case W/200W PS
101 Enhanced Keyboard

HOMESMART COMPUTING (800) 627-6998

All Prices Subject to Change

MCVISA/COD Accepted

CIRCLE 752 ON READER SERVICE CARD



**VOICE MAIL
CALL PROCESSING
TELEMARKETING**

Let Powerline™ transform your
PC/XT/AT/386 into a multi-line voice
processing command center. Have
your computer intelligently pro-
cess your sales, inquiries and
messages. Complete package.

Single Line (Bgn/Out) .. \$295.00
Multi-Line .. \$895.00
(Divides OEM packages available)

Call: (415) 522-3800

FAX (415) 522-5556

TALKING TECHNOLOGY, INC. TTI

1125 ATLANTIC AVENUE ALAMEDA, CA 94501

CIRCLE 756 ON READER SERVICE CARD

MEMORY UPGRADES

PS/2, AST, H-P, SUN
COMPAQ, ZENITH
STD SIMMS & SIPS
MEMORIES FOR
LAPTOPS/LASER PRINTERS
BEST QUALITY, BEST PRICE, NO RISK

**ADD ON
AMERICA**

A DIVISION OF ROHM CORPORATION
433N. MATHILDA AVE. SUNNYVALE, CA 94088
TEL (408) 746-1590 FAX (408) 746-1593

800-292-7771

CIRCLE 757 ON READER SERVICE CARD

To place your ad in

**PC MAGAZINE
Marketplace**

Call (212) 603-5115
or (800) 825-4ADS

Memory - Laser Printer - Memory - Laptop - Memory

4MB Capacity Expandable Memory Board:

- HP LaserJet II, IID, IIP, III and IIID
- Panasonic 4420, 4450I and 4450
- IBM 4019 and 4019E
- OKIDATA Okilaser 400/800
- EPSON EPL-6000, Toshiba PageLaser6

1/2 4MB Memory Upgrade for Notebook:

- Toshiba T1000SE/KE/LE
- Toshiba T1200XE
- Toshiba T2000SX
- Compaq LTE/286
- Compaq LTE/386

EXP Computer, Inc. 516-496-3703 Fax 516-496-2914

CIRCLE 753 ON READER SERVICE CARD

CD-ROM

CD-ROM / WORM / ERASABLE

HITACHI • NEC • PIONEER • SONY
• DENON • MICRO DESIGN • PLASMON
• STORAGE DIMENSIONS

Pioneer DRM-660 Minichanger\$999
Pioneer DE-S7001 Multifunction\$3,999
386SX-CD System with VGA\$2,995

GSA# GS00K90AGS5317

call for free catalog
1-800-MEGABYTE
Fax: 212-737-8299

**COMPACT
DISK
PRODUCTS**

222 East 85th Street, New York, NY 10028

CIRCLE 754 ON READER SERVICE CARD

COMMUNICATIONS

FAX

WE'LL MATCH ANYBODY!

PANAFAX	SHARP
PD120 \$569	FO230 \$599
UF160 \$699	FO334 \$799
UF170 \$899	
UF270 \$1099	1000 \$499
UF300 \$1599	2000 \$599

AUTHORIZED DEALER CALL FOR OTHER MODELS

LASER PRINTERS

AUTHORIZED OKIDATA DEALER

OKILASER 400	OKILASER 800
4 ppm/min 512K RAM 17 fonts 200 sheet cassette 1 year warranty	\$699 OKILASER 820 \$1299 8 ppm 512K scalable fonts OKILASER 840 \$1999 Postscript, 2Meg, 8 ppm

B.C.S. GROUP, INC. - Va. Bch, VA 23454

1-800-333-2955

CIRCLE 755 ON READER SERVICE CARD

COMPANION

Add an Extra
Keyboard and Monitor to
your CPU up to 600 ft. away.

- IBM PC, XT, AT, PS/2 and 100% Compatibles
- Available for MDA, CGA, EGA (TTL) and VGA (Analog) Monitors

- 25, 50, 100, 150, 200, 250 ft. lengths
- No external power required
- Lengths up to 600 ft. available by Special Order
- Multiple Monitor Configurations available
- Prices start at \$219.

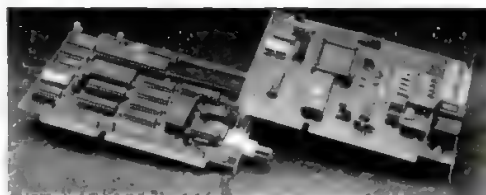
CYBEX CORPORATION
2800 H. Bob Wallace Avenue
Huntsville, AL 35805
(205) 534-0011



CIRCLE 758 ON READER SERVICE CARD

COMMUNICATIONS

INVISIBLE NETWORK



Invisible Software offers a full line of network products

"Good performance under load, elegant design, low price, simple cabling requirements, and broad compatibility."
—PC Week

"The Invisible Network is terribly easy to install. And it's inexpensive."
—LAN Magazine

"A joy to use. I highly recommend it."
—Data Based Advisor

"...Ran flawlessly... We confidently recommend Net 30..."
—Byte Magazine



Invisible Software, Inc.

Invisible Network is the first LAN to support expanded memory. Your DOS memory overhead can be as little as 3K for a work-station, 13K for a server. And you can increase DOS memory from 640K to 704K—Now you can have over 630K of free DOS memory while running the network! Without expanded memory, the overhead is still low: 60K for a workstation, 80K for a server.

- Prices include network boards and software—nothing extra to buy.
- NET/30 network operating system is full-featured, easy to install, and has extensive on-line help.
- File sharing, print spooling, file/record locking, electronic mail, menu system, security, network management, diskless workstations, diagnostics, NetBIOS. Runs Novell Network.

NEW! FASTER ETHERNET. We've speeded up our Ethernet products with improved software, larger on-board RAM, and new 16-bit Ethernet boards.

Call (415) 570-5967, M-F, 9-6 Pacific Time.

	Compatibility	Speed	Wiring	Price
Model 200	IBM PC/XT/AT, 8 Bit	1.8 Mbps	Twisted Pair	\$215 ea
Model 300	IBM PC/XT/AT, 8 or 16 Bit	3.0 Mbps	Twisted Pair	\$315 ea
Model 300/A	Micro Channel, 16 Bit	3.0 Mbps	Twisted Pair	\$399 ea
Ethernet	IBM PC/XT, 8 Bit	10.0 Mbps	Thin Coaxial	\$369 ea
Ethernet 16	IBM AT, 16 Bit	10.0 Mbps	Thin Coaxial	\$369 ea
Ethernet/A	Micro Channel, 16 Bit	10.0 Mbps	Thin Coaxial	\$469 ea

Guaranteed Quality. We design and manufacture all our own products. 30 day money-back guarantee and one-year warranty on hardware. Free technical support by telephone.

1142 Chess Drive Foster City, CA 94404 FAX (415) 570-6017
Call (415) 570-5967

COMPUTER SYSTEMS

AMI 386/486 CACHE MOTHERBOARDS

You deserve the absolute BEST! Forget MYLEX & the rest. ISA & EISA! PC Magazine May 1989 proved AMI is the BEST! We are the largest AMI reseller! BEST price guarantee!

INTEL Inboard 386/PC 1MB PIGGY-BACK SPECIAL \$299
80387-16-\$289 20-\$335 80287-8-\$149 10-\$185 80C287A-\$249

PC WEEK Rated Cyrix #1 80387-25 \$399 80387-33 \$479

MAXTOR & Microscience Drive Bundle
ESDI 80MB w/Ultrastor Controller \$549

PC PROS 708/810-1010 FAX 9490
8205 S. CASS AVE. DARIEN, IL 60559

CIRCLE 759 ON READER SERVICE CARD

AMI 386/486

Mother Board Specials This Week

	4MB	8MB
AMI MK II 386-25 64K Cache	\$1190	\$1390
AMI MK II F4 386-33 64K Cache	1390	1590
AMI MK IV Screamer 64K Exp	1690	1890
386-33 250K Cache	2690	2890
AMI Voyager 486-25 128K Cache	3290	3490
AMI Voyager 486-33 128K Cache	3290	3490
Micronics 386-25 BWP No Cache	990	
Micronics 386-33 of o/c	1390	1590
64K Cache, ide, 2x/tp ports		
Micronics 486-25 ISA 64K Cache	2490	2690
AMI/Micronics ISA 486-25-33	CALL	CALL

USM • PIXEL Ultimate VGA-1MB
1024x768, 256 Colors Best For
Windows 3.0, WP 5.1, AutoCad **\$175**

CONNER

CP3044	40 MB	\$299
CP3184	80 MB	469
CP3104	100 MB	499
CP3204	200 MB	799
MAXTOR CDC	CALL	

COMPLETE SYSTEMS
FAX OR
CALL YOUR
CONFIGURATION
FOR THE BEST PRICE

FOR BEST PRICE PERFORMANCE SYSTEMS - CALL USM

USM DISTRIBUTORS 415-623-9040 (DAN) 415-952-5885 (RAMON) 43104 Christy St. Fremont, CA 94538
714-255-0113 (GEORGE) 408-980-0602 (BRIAN) Fax 415-623-7592

CIRCLE 760 ON READER SERVICE CARD

Rent From The Leader.

PCR PERSONAL COMPUTER RENTALS

The Professionals in Computer Rentals™

1-800-444-9930

Locations
Coast-To-Coast

Each franchise is independently owned & operated.
Franchise Opportunities Available.

CIRCLE 761 ON READER SERVICE CARD

XT CLONE 10MHz 640K 20MB MONO SYS	\$599
286 12MHz 1MB RAM 40MB MONO SYS	\$734
386SX 16MHz 1MB RAM 40MB VGA SYS	\$1275
386 20MHz 1MB RAM 40MB VGA SYS	\$1930
486 25MHz 1MB RAM 40MB VGA SYS	\$2912
SEAGATE ST 251.1 41MB 15MS HD	\$229
SEAGATE ST 4096 81MB 15MS HD	\$495
SEAGATE ST 1111A 124MB DE 15 15MS	\$569
MITSUBISHI 40MB 15MS 8.4 28MS HD	\$255
W. DIGITAL WD 910444 40MB IDE AT 12MS	\$219
WD CAVIAR WD40-28032R 30MB IDE 1 12MS	\$469
CONNER CP3044 40MB DE AT 15MS HD	\$299
CONNER CP3184 80MB DE AT 15MS HD	\$450
CONNER CP3104 100MB IDE AT 15MS HD	\$499
CONNER CP3204 200MB IDE AT 15MS HD	\$799
FUJITSU 1 2MB F. JPPY DRIVE 5 25	\$58
FUJITSU 1 44MB F. JPPY DRIVE 5 25	\$59
FUJITSU 101 CLCK KEYBOARD 4700	\$42
NANAP 90705 90709 90801 94001	CALL

DMC 1234 South St. Long Beach, CA 92615
Tel: (213) 422-4444 Fax: (213) 422-7070 & 422-8643
CIRCLE 762 ON READER SERVICE CARD

Did you know...

On average, PC Magazine's direct market purchasers have spent—

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order

PC Magazine is exclusively read by over 763,398* business buyers and brand specifiers, including 90,000 computer resellers and consultants.

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts. Call your PC Magazine Marketplace Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

Source: Beta Research Study 1988
*BPA Audit June, 1990

DISKETTES

Quality Diskettes

diskettes plus

1-800-259-2839

ALL PRODUCTS 100% GUARANTEED

Special!

3 1/2" DS/HD 1.44 MB

69¢

25¢ 5 1/4" DS/DD 40TPI

25¢ 3 1/2" DS/DD 135TPI

39¢ 5 1/4" DS/HD 360TPI

10105 E. Via Linda, Suite 103-395 ■ Scottsdale, Arizona 85258

CIRCLE 769 ON READER SERVICE CARD

Next Day Shipping

COLORS

5 1/4" DS/DD 350

RED - LT. BLUE - DK. BLUE - GREEN

GREY - MAGENTA - WHITE

5 1/4" DS/HD 39¢

25¢ IN LOTS OF 50

BULK DISKS

SONY VERBATIM KAO

5 1/4" Include Sleeves 24 Hour Shipping

ITEM	PRICE
5 1/4" DS DD	.33
5 1/4" DS HD	.54
3 1/2" DS DD	.52
3 1/2" DS HD	1.09

SOFTWARE DUPLICATION

Quality Duplication at Affordable Pricing

Fast Turnaround Time

Custom Labeling & Packaging

PRINCETON COMPUTER

1101 Richmond Ave. #100 Princeton, NJ 08542

CIRCLE 772 ON READER SERVICE CARD

BUY A BETTER BULK DISKETTE

NAME BRAND BULK

VERBATIM

ITEM	PRICE
5 1/4" DS/DD	.28¢
5 1/4" HD	.37¢
3 1/2" DS/DD	.27¢
3 1/2" HD	.36¢

SONY

ITEM	PRICE
5 1/4" DS/DD	.50¢
5 1/4" HD	.59¢
3 1/2" DS/DD	.49¢
3 1/2" HD	.58¢

PREMIUM GENERIC

100% CERTIFIED, HIGH QUALITY

ITEM	PRICE
5 1/4" DS/DD	.24¢
5 1/4" HD	.33¢
3 1/2" DS/DD	.23¢
3 1/2" HD	.32¢

100% GUARANTEED media source

SINCE 1986

800-356-2553

FAX (404) 952-1432

CIRCLE 774 ON READER SERVICE CARD

ONE MAGAZINE DELIVERS THE BIGGEST MARKET OF PC BUYERS: PC MAGAZINE

763,398

BPA Audit June, 1990

DISK DRIVES

10% OFF • HARD DRIVE REPAIR COUPON • 10% OFF

CAPACITY	MSRP	JB/SCSI
10-19mb	\$85	\$85
20-29mb	105	95
30-39mb	125	125
40-49mb	165	165
50-59mb	210	210
60-69mb	295	295
121-150mb	345	345
151-275mb	395	395
276-675mb	N.A.	N.A.

Test & Evaluation \$25

VALID THROUGH 3/31/91

WE REPAIR MOST MAJOR BRANDS

CALL FOR DATA RECOVERY

also...

SALES & EXCHANGES

FLOPPY DRIVE REPAIR

Commercial Accounts Welcomed

120 days warranty on HD repairs - 5-10 day turnaround time

PLEASE ADD \$0 for return shipping. Include coupon with drive.

WE BUY NON-WORKING & WORKING DISC DRIVES (in quantities)

JB TECHNOLOGIES, INC.

5105 Maureen Lane
Moorpark, CA 93021

jb TECHNOLOGIES, INC. Tel: (805) 529-0908 Fax: (805) 529-7712

CIRCLE 770 ON READER SERVICE CARD

MAXELL • SONY VERBATIM • BASF

100% CERTIFIED LIFETIME WARRANTY

ITEM	PRICE
5 1/4" DS/DD	\$.39 each
5 1/4" DS/HD	.59 each
3 1/2" DS/DD	.59 each
3 1/2" DS/HD	1.09 each

Price based on a minimum lot of 300 units. Includes Type, capacity and label.

PREFORMATTED • COLORS • TAPES

800-222-0490

In NJ 201-462-7628 FAX 201-462-5658

• 24 Hour Shipment •

MEGAsoft

PO Box 710, Freehold, NJ 07728

CIRCLE 773 ON READER SERVICE CARD

SOFTWARE PACKAGING

- Custom & Stock Product Boxes
- We have the solution to your software packaging needs
- Graphic & Product design available
- Plain or Printed one color to four color process
- Small quantity orders accepted

Call now for information or to order

1-800-443-7712

715 E. Washington St. Jersey Chester, PA 19380

unipak

CIRCLE 775 ON READER SERVICE CARD

DISK DRIVES

PS/2 & AT HARD DISK SOLUTIONS.

Failsafe AT & PS/2 Novell Compsurfed Kits

Straight from the Box Integration

Discover Perisol Technology's snap integration devices, precise manuals and thorough assistance. We support DOS, OS/2, Xenix, Netware 286 & 386 for both AT & PS/2s. No compatibility issues. No problems. It's that simple.



1 Gb Erasable OPTICALS

Call for Perisol's Complete Product Catalog

Flawless Performance

The power user's first choice. Perisol's subsystems offer failsafe peak performance without stretching your budget.

- ✓ Caching Controllers
- ✓ Disk Mirroring & Duplexing
- ✓ Torture-Tested Drives w. 24-hour Burn-in
- ✓ Up to 4 Year Extended Warranty

800-447-8226

Fax: +08-988-4431 Support: 800-228-4489 International Tel: +08-988-2232

Drive, Controller, Cables and Software included with Kits.

System	Capacity	Access	Interface	Price
AT	86 MB	19 ms	AT	\$455
AT	110 MB	18 ms	ESDI	\$803
AT	120 MB	19 ms	AT	\$549
AT	158 MB	14 ms	ESDI, SCSI	\$946
AT	200 MB	15 ms	AT	\$871
AT	213 MB	15 ms	SCSI	\$961
AT	338 MB	16 ms	ESDI, SCSI	\$1443
AT	652 MB	16 ms	ESDI, SCSI	\$2065
PS/2	150 MB	14 ms	ESDI	\$1269
PS/2	330 MB	16 ms	ESDI	\$1736
PS/2	652 MB	16 ms	ESDI	\$2343

Maxtor

CIRCLE 771 ON READER SERVICE CARD

EXPANSION UNITS



CALL DRAM CO.
For the best DRAM products, prices & service!

- Free Shipping (on orders over \$300.00)
- 100% Guaranteed (on all products)
- 1 Year Warranty (on all products)
- Volume Discounts Available
- P&H Welcome
- No Visa/MC charge
- C.O.D. Cash/Ch. OAC
- Prices subject to change

DRAMs		IBM Type SIMMS		PS/2 Type SIMMS	
1MEG X 1 100NS	\$4.40	4MEG X 9 80NS	\$258.00	6450R03 1MEG	\$78.00
1MEG X 1 80NS	\$4.70	1MEG X 9 100NS	\$48.00	6450R04 2MEG	\$130.00
1MEG X 1 70NS	\$4.80	1MEG X 9 80NS	\$47.00	6450R08 2MEG	\$150.00
1MEG X 1 60NS	\$5.95	1MEG X 9 70NS	\$49.00	30F5348 512K	\$30.00
256K X 4 80NS	\$5.20	1MEG X 9 60NS	\$55.00	30F5360 2MEG	\$190.00
256K X 1 150NS	\$1.30	256K X 9 100NS	\$15.00		
256K X 1 120NS	\$1.40	256K X 9 80NS	\$16.00		
256K X 1 100NS	\$1.60	256K X 9 60NS	\$22.00		
256K X 1 80NS	\$1.70				
256K X 1 70NS	\$1.90				
256K X 1 60NS	\$2.25				
64K X 4 80NS	\$2.45				
64K X 1 120NS	\$1.25				
64K X 1 100NS	\$1.45				

INTEL MATH CO-PROCESSORS

80287 8MHz	\$180.00
10MHz	\$200.00
XL	\$210.00
80387 165X	\$280.00
16MHz	\$300.00
20MHz	\$345.00
25MHz	\$435.00
33MHz	\$545.00

EXPANSION UNITS

HP LASERJET BOARDS
EVEREX EXP BOARDS

CYRIX FASMATH CO-PROCESSORS

386 SERIES	CALL
------------	------

CALL DRAM CO.
(415) 398-2987
(800) 488-DRAM
FAX (415) 398-5402

P.O. Box 590127, San Francisco, CA 94159-0127

CIRCLE 776 ON READER SERVICE CARD

PRINTERS



Hassle-Free Printer Sharing

SNAP Transmitter \$49 (includes 25 ft. cable)
SNAP Receiver \$55

Just attach a SNAP transmitter to the parallel port of each PC, a receiver to the printer, and connect with up to 1200 ft. of phone cable. As you add more PCs, simply plug in more transmitters. No software! No training!

call **800/445-6190**
to order your SNAP or to receive our **Free Catalog**
VISA/MC, AMEX are accepted

ASP Computer Products, Inc.
1026 W. Maude Ave., Suite 305
Sunnyvale, CA 94086
FAX: 408-746-2003

CIRCLE 781 ON READER SERVICE CARD



CHIPS!
OVER 40 MILLION SOLD SINCE 1985

- DYNAMIC RAM • SIMM / SIPP
- 41256 • 1MEG
- 44256 • 4464
- 4164 • ALL SPEEDS!

UPGRADES: PC2, AT, COMPAT, TOSHIBA, DELL, ETC.

MATH • EPROM • CO-PROCESSORS

• CPU •

• RAM •

CALL FOR PRICES!
WE'LL BEAT ANY PRICE!

1-800-827-CHIP
CALIFORNIA MICROCHIP

SAME DAY SHIPPING!
IN CALIF. 818-882-1555

CIRCLE 777 ON READER SERVICE CARD



ICs PROMPT DELIVERY!!!
SAME DAY SHIPPING USUALLY
QUANT. 1000+ FOR ALL 4-100+

Memory For Almost ALL Computers

DYNAMIC RAM

4M Board for no L3 & 2MB	\$180.00
SIMM 2M IBM PS 2 Model 70	145.00
SIMM 4MB 80 ns	290.00
SIMM 1MB 80 ns	52.00
4MB 1 4MB 1 80 ns	38.00
4MB 1 1MB 1 80 ns	47.00
1MB 1 1MB 1 80 ns	5.60
41256 256Kx1 100 ns	2.40
41256 256Kx1 120 ns	2.20
44256 256Kx4 100 ns	5.25
4484 64Kx4 100 ns	1.95
41264 64Kx4 100 ns	5.95

EPROM

27C1000 128Kx8 200 ns	\$14.00
27C512 64Kx8 120 ns	5.25
27256 32Kx8 150 ns	6.75
27128 16Kx8 250 ns	3.65

STATIC RAM

62256P-10 32Kx8 100 ns	\$6.95
6254P-12 8Kx8 120 ns	4.25

OPEN 6 DAYS 7 AM-10 PM SHIP VIA FED-EX ON SAT

CALL OR FAX FOR PRICES
FAX: (918) 267-4961

CIRCLE 779 ON READER SERVICE CARD



and other brands of

LaserJet Enhancements

- Lowest Prices Guaranteed
- See Our Full Page Ad in Previous/Next PC Magazine

We Know What We Sell.

CALL
1-800-747-HPLJ
1-800-747-4755

1940 Cotner Ave.
Los Angeles, CA 90025
FAX: (213) 478-4770
Phone: (213) 479-4477

CIRCLE 782 ON READER SERVICE CARD

SAVE ON HP!!

PaintJet	\$660	RuggedWriter	\$675
DeskJet	\$375	LaserJet IID	\$1,700
DeskJet+	\$425	7470 Plotter	\$450
DeskWriter	\$525	7440Plotter	\$650
ScanJet	\$425	7475 Plotter	\$825
ScanJet+	\$750	7550 Plotter	\$1,500
ThinkJet	\$225	Sketchpro	\$250

All above equipment demo or used with warranty
Call for other HP items not listed

LaserJet II, IID, HP III Memory
1MB - \$125 2MB - \$185 4MB - \$295
Call for prices on Pacific Data, IQ Engineering
DeskJet accessories, paper trays, toners, etc

800 441-1491
New in the marketplace

COMPUTER BUSINESS MART
8450 Lusk Blvd E102 San Diego, CA 92121
(619) 453-8445 • FAX (619) 558-3088
CIRCLE 783 ON READER SERVICE CARD

PRINTERS

continues

on the next page.

MEMORY ICs !!!

4Mx9 80ns	\$220.00
PS2 2Meg simm	\$110.00
AST 1Meg simm	\$ 57.00
1Mx9 80ns	\$ 43.00
1Mx8 80ns	\$ 39.50
1Mx1 100ns	\$ 4.25
256x4 100ns	\$ 4.50
41256 120ns	\$ 1.90
41464 100ns	\$ 2.40
2800 80ns	\$ 2.75
4164 120ns	\$ 1.70

* Call for quantity discounts, high-speed parts, SIPP

MATH CO-PROCESSORS

80387-33	\$635.00	80387-16	\$775.00
80387-33	\$170.00	80387-16	\$245.00
80387-33	\$170.00	80387-16	\$175.00
80387-16	\$170.00	80387-16	\$170.00

* V-20 670MHz \$ 8.5/15

I.C. EXPRESS

15140 Valley Blvd. City of Industry, CA 91744
1-800-877-8188
FAX: (618) 369-1238 (Mon.-Fri. 8-5 PST)
CALL FOR CURRENT PRICES & VOLUME DISCOUNTS
Customer service: (818) 333-8880 (day) 24/7 (3-5 PST)
Price shown for cash. MasterCard/VISA add 3%
Prices are subject to change. Minimum order \$10.00
Shipping & handling: UPS \$10.00. Air \$10.00 (1 to 1)
CIRCLE 778 ON READER SERVICE CARD

TERABYTE INTL

MOTHER BOARD

IBM-3254K CACHE	4MB \$1095	8MB \$1875	16MB CALL
IBM-2544K CACHE	4MB \$1250	8MB \$1550	16MB CALL
286-25	1MB \$ 800	2MB \$1000	4MB \$1090
386SX-16	1MB \$ 485	2MB \$ 580	4MB \$ 740

MODEM 2400 BSP INTERNAL \$ 65.00
VGA CARD 512K 1024X768 \$135.00
AT IO CARD S/PIC OR MORE CALL
CASES (WITH POWER SUPPLIES) CALL

D-RAMS

64KX4 -10	\$ 3.50	80387 -33	\$545
256KX1 -10	\$ 2.20	80387 -25	\$445
1 MEGX1 -08	\$CALL	80387 -20	\$345
256KX4 -08	\$ 6.90	80387SX	\$285

SIMMS & SIPP

1 MEGX9 -80	\$CALL	80287XL	\$215
256KX9 -80	\$22.00	CACHE MEMORY	
		80KX8 -25	\$ 14

CALL FOR IBM PS/2 AST AND MORE
CALL FOR CURRENT PRICES & VOLUME DISC

ORDER 800-688-BYTE
TERABYTE INTL INC.
20710 MANHATTAN PLACE #116 TORRANCE CA 90501
TEL 213-787-9736 FAX 213-787-9735
PRICE SUBJECT TO CHANGE WITHOUT NOTICE

CIRCLE 780 ON READER SERVICE CARD

PC MAGAZINE MARKETPLACE

2nd Color Option
Available

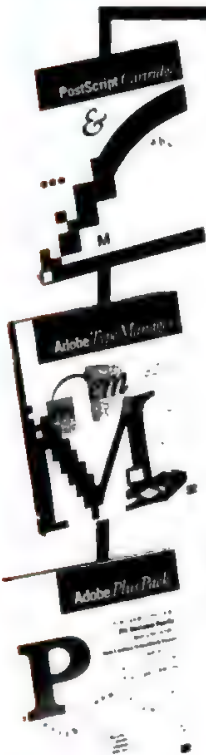
Did you know...

PC Magazine Marketplace generated a whopping \$200 million in sales revenue for its advertisers, resulting in these expenditures—

- Over \$52 million in applications software
- Over \$52 million in computer systems
- Over \$22 million in supplies
- Over \$12 million in systems
- Over \$61 million in peripherals
- Over \$500,000 in consulting services
- Over \$8.9 million in other computer products and services

Source: Beta Research Study, 1988

PRINTERS



*We Know What We Sell.
Now We Know...*

ADOBE

PostScript Cartridge From Adobe®\$245

Now your HP LaserJet II can have all the benefits of genuine PostScript® software with the PostScript Cartridge from Adobe®. Print complex graphics, high-quality text using any of the 35 PostScript® language outline font programs included, and enjoy unmatched software and hardware capability. The best of its kind.

Adobe Type Cartridge 1 & 2\$227

Genuine Adobe type faces for the LaserJet II user.

Adobe Type Manager™/Windows\$58

ATM™ Software gives you the professional look by taking the jagged edge off your printed text and improving the text displayed on your monitor.

Adobe Type Manager™ Plus Pack\$107

This is the standard font set for anyone who wants to build a well-rounded type library. And for ATM™ owners, these 22 PostScript® language outline fonts are the same found in most PostScript® printers from Adobe.

Additional font packages:

Adobe Type Set 1\$57

Adobe Type Set 2\$57

Adobe Type Set 3\$117

Collection of exciting faces for awards and newsletters, or what ever you're doing that needs a little extra zip.

Adobe PostScript and the PostScript logo are registered trademarks and, Adobe Type Manager and ATM are trademarks of Adobe Systems Incorporated, registered in the U.S.A.
© 1990 Adobe Systems Incorporated. All rights reserved.

DH Systems carries a complete line of LaserJet Printer enhancements. All guaranteed to be at the lowest prices. Call now for more information.

1-800-747-HPLJ

1-800-747-4755

CIRCLE 784 ON READER SERVICE CARD

1940 Cotner Ave.
Los Angeles, CA 90025
Fax: (213) 478-4770
Phone: (213) 479-4477

DH
systems

TAPE DRIVE SUBSYSTEMS

EDITOR'S CHOICE

"The clear winner among half-inch nine-track tape back-up devices"
PC Magazine April 25, 1989

- Data transfer rate of 1 MB per second
- Excellent user interface
- Onboard Error Handler
- Full controllerless tape system
- Expert Support System

Call Chi today
216 349 8600

Chi
Computing
202 Carter Street
Solon, Ohio
Fax 216 349 0620

CIRCLE 785 ON READER SERVICE CARD

SAVE ON

9 TRACK TAPE SYSTEM

FOR IBM PC/XT/AT & PS-2

- Mainframe to PC Data Transfer
- High Speed Backup
- All Software, Complete System
- Service and Support, easy installation

call (818) 343-8595 or write to:
CONTECH Computer Corp.
P.O. Box 153 Torrance, CA 91356

CONTECH

CIRCLE 786 ON READER SERVICE CARD

9 TRACK TAPE SYSTEMS - RENT OR BUY

9 TRACK TAPE \$1995

\$250 Monthly Rental

LEASES RENTALS SALES

Call (800) 266-4TAPE (714) 497-0660 Fax (714) 497-5569

LAGUNA CONVERSION SYSTEMS

CIRCLE 787 ON READER SERVICE CARD

**3 out of 4 Marketplace readers
increase their awareness of new products
through this section**

**call now to place your ad
1 (800) 825-4ADS**

■ TAPE DRIVE SUBSYSTEMS



Spectacular Performance. Now Playing On 9-Track Tape.

CIRCLE 788 ON READER SERVICE CARD

Overland Data subsystems deliver spectacular performance play after play. Stay for the credits and you'll see why:

Speed. Overland Data offers subsystems with the fastest data rates in the industry. There's never a dull moment.

All Star Cast. We offer eight different tape drives by major manufacturers. And our new TXi controller card transfers data so fast, it may just steal the show.

Versatile Performance. Exchange data between your PC's, mainframes and mini's. Use any IBM PC, compatible, or PS/2. Run under DOS, UNIX, XENIX and PICK. Convert from EBCDIC to ASCII and back. Backup your hard disk. And more...

Well Developed Characters. We develop our own custom software for advanced data transfer, conversion, and backup.

A Great Supporting Cast. You have all of Overland Data behind your subsystem. Expert sales and customer service staff are always ready to help you by phone. We can deliver to you in 24 hours. We back your tape drive for one year and your controller card for two years. And your subsystem comes with a 30-day, money back guarantee that it will meet your application needs.

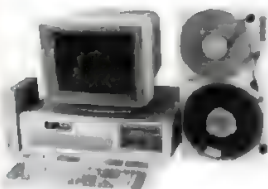
All of which means that whenever you play 9-track tape on an Overland Data subsystem, you're in for a spectacular performance. To reserve your seat, call us at

1-800-PC9-TRAK

OVERLAND DATA
San Diego, CA

1-800-729-8725 • 1-619-571-5555 • FAX 1-619-571-0982 • TELEX 754923 OVERLAND

9-Track Tape Subsystem



Now you can exchange data files between your IBM PC/XT/AT and any mainframe or mini-computer using IBM compatible 1600 or 6250 BPI 9-Track tape. Unit can also be used for disk backup. Transfer rate is up to 4 megabytes per minute on PCs and compatibles. Subsystems include 7" or 10 1/2" streaming tape drive, tape coupler card, cables and software.

QUALSTAR

9621 Irondale Avenue
Chatsworth, CA 91311
Telephone: (818) 882-5822
CIRCLE 789 ON READER SERVICE CARD

■ SOFTWARE/ACCOUNTING

MIP Fund Accounting System

Simply the best software for non-profit & governmental organizations since 1962.

Flexible Chart of Accounts • Automatic Offset & Interfund Balancing • Automatic Cost Allocations • Monthly Budgeting & Forecasting • Check, P.O., & A/R Bill Printing • Multiple Funds • Multiple Overlapping Fiscal Years • User Defined Reports • IBM PC/XT/AT Compatible • Single User or Network • User Installable

Modules: General Ledger, Budget Reporting, Accounts Payable, Encumbrances, Accounts Receivable, Database Interface, Payroll, Fixed Assets

1-800-647-3863

505 East Huntland Drive, Suite 340, Austin, TX 78752

\$45 — Complete Accounting Software

PACIOLI 2000™ CONTAINS: IBM & Compatibles
• Billing, A/R, Inventory, A/P, G/L, Purchasing, Budgeting, Auditing — All Integrated
• **FREE** UNLIMITED CUSTOMER SUPPORT.
• **FREE** 2 HOUR TRAINING VIDEOTAPE

Use as single-user or multi-user system (network ready)

"The equal of other high end accounting programs in every way but cost!"

New York Times, July 1, 1990

VISA/MC Orders only: 800-243-1515 Ext. 800 EF Questions: 214-931-2033
Or Check/MO — Add \$6 shipping to: S. Software, 2880 Bergey Road, Dept. 800 EF, Hatfield, PA 19440

CIRCLE 790 ON READER SERVICE CARD

DBASE ACCOUNTING TOOLS

*General Ledger	*Accts Payable
*d/Invoicer & A/R	*Sales Analysis
*Service Billing	*Order Entry
*Job Costing	*Job Estimating
*Purch Ord/Inventory	*Payroll
*Bill of Mats	*Lazr-Forms

\$99 ea + s&h w/DBASE 3+ or 4 Source Code
DATAMAR SYSTEMS (619) 223-3344
4876-P Santa Monica Avenue
San Diego, CA 92107
MasterCard-Visa-AMEX-Check-COD

PARADOX™ ACCOUNTING

Our package includes these choices in an integrated system, no modules: Checking, Invoicing, A/R, Purchasing, A/P, Inventory, General Ledger with full departments, Employee/Sales tracking, Quattro/Quicken/123 Interface Demo \$35, Single-user \$150, Network \$395
MIKE OLMSTED, CPA
P.O. Box 8880
So. Lake Tahoe, CA 95731
(916) 544-6778

Calling about an ad? Say you saw it in
PC Magazine Marketplace

ACCOUNTING

**What do more than 1400
Government and Nonprofit
Organizations Know?**

**When You Need Fund
Accounting Software... You
Need American Fundware.**

American Fundware provides powerful software solutions - written specifically for the government and nonprofit sectors - that solve your fund accounting needs. Easy to Learn. Easy to Use. Easy to Produce Results.

FOR MORE INFORMATION CALL
AMERICAN FUNDWARE TODAY

1-800-551-4458 or Fax: 1-303-479-6850
P.O. Box 773028, Steamboat Springs, CO 80477
See us at Comdex Fall 1990 Booth 2381
CIRCLE 791 ON READER SERVICE CARD

INTRODUCING PREMIER

The brightest new spot in the Marketplace. PREMIER will help you create the solid company image that gives real support to your product message. Four-color quarter and eighth-page ads at black and white rates let buyers focus their attention directly on you.

Call your Marketplace representative today at **1-800-825-4237** for more information and be sure to ask about our 20% Charter Discount!



Debuting April 16, 1991
Ad Close-February 11, 1991

BUSINESS

**High-end
groupware.**

At \$395 for up to 20 users,* and \$895 for more, Office-Minder™ offers you the lowest-cost-per-user in the industry.

Yet OfficeMinder offers you more practical office capabilities, E-mail, Bulletin board, Address management, Schedule and Project management, To-Do lists, Person-In/Out board and much more.

OfficeMinder includes On-line help, Mouse support, Alarms, Dialer, mail Binders with folders and MHS compatibility.

Using less than 5k of RAM, one of the smallest groupware TSRs available.

Call 1-800-557-4492 today for a brochure and a FREE demo package. 30-day money back guarantee.

* Limited-time offer
\$395.
Regular price \$495

csi

Century Software Incorporated
Woodridge Technology Park
310 N. Wilson Ave.
Hartford, Wisconsin 53027
414-673-4424 • BLX: 414-673-9112

**Low-end
price.**

CIRCLE 792 ON READER SERVICE CARD

COMMUNICATIONS

MULTI-LINE PC-DOS BBS

The Bread Board System (TBBS) Secure reliable, full-featured commercial information system for IBM and compatibles. Menu editor allows customization by nonprogrammers. Kermit, X & Y-Modem. High performance allows up to 32 simultaneous callers. Up to 38,400bps dBASE module available. eSoft, Inc.
15200 E. Girard Ave. #2550
Aurora, CO 80014
(303) 699-6565

CONSTRUCTION

CONSTRUCTION ACCOUNTING

Comprehensive, affordable software for builders and contractors. Job cost, billing and draws, payables, check writing, purchase orders, discount and retention tracking, all in one package—\$795. Reviewed and approved by National Assn. of Home Builders. Also available: General Accounting and Payroll.

YARDI SYSTEMS, INC.
813 Reddick Street
Santa Barbara, CA 93103
805-966-3666

**RJE on a PC
Print 20,000 lines/minute**

Call Barr Systems for the most powerful solution to your volume printing and file transfer needs. BARR brings you the freedom to use any printer on a PC.

Features:

- connect up to four S/370 channel-attached printers
- LAN gateway service
- print spooling
- unattended operation
- electronic forms management
- line speeds to 256,000 bps
- dial-up or dedicated lines
- easy to learn and use
- nine-track tape support

Mainframe Protocols Supported:

- SNA RJE with SDLC or Token Ring (TIC)
- HASP, 3780, 2780

BARR

Barr Systems, Inc.
4131 NW 28 Lane
Gainesville, FL 32606
800-BARR-SYS or
800-227-7797

CIRCLE 795 ON READER SERVICE CARD

TO BUILD YOUR PROFITS... YOU NEED PRO-MATION

Pro-Mation provides powerful accounting software solutions - written to estimate manage the dynamic cost structure facing the modern construction company. Easy to learn. Easy to use. Easy to produce results.

For More Information Call Pro-Mation Today Toll-Free 1-800-521-4562 or Fax 1-801-566-9305

PRO-MATION
A T. AGSHIP COMPANY

See us at World of Concrete
Booth 2438 / L.V.C.C.

1145 East South Union Avenue
Midvale, Utah 84047

CIRCLE 793 ON READER SERVICE CARD

DATA BASE

ANSI SQL DBMS FOR PROGRAMMERS, ONLY \$195

SUPPORTS - Turbo C • Turbo Pascal • Microsoft C • QuickBASIC • Micro Focus COBOL
All Compilers are trademarks of the respective Manufacturers.

Ocelot SQL gives you everything you expect from a SQL Database. It is:
SMALL (needs only 320 KB RAM)
FAST (written in assembly language)
DB2 COMPATIBLE (conforms to industry standard)
FLEXIBLE (runs embedded and stand-alone)
and it includes REFERENTIAL INTEGRITY.

(619) 452-2265

single user for Windows. \$195
single user for Basic, Pascal, C \$195
ditto with unlimited runtime \$895
multi-user for all languages \$850
ditto with unlimited runtime \$1850
S&H US\$45, CANAMEX\$10, Other\$15 -CA add tax

BIENERSOFT, INC.
6540 Lusk Blvd. Suite C-106
San Diego, CA 92121

CIRCLE 794 ON READER SERVICE CARD



dBASE file access from C or C++

Build a multi-user, 85k, dBASE compatible application using pulldown menus, popup windows, and data entry from pick lists. Then port your application to UNIX, Microsoft Windows, OS/2 without changing a single line of code. \$295 with source code. Request a free demo or order Code Base on a 30 day trial.
Sequiter Software Inc.
P.O. Box 5659 Station L
Edmonton, Alberta Canada T6C 4G1
Call (403) 448-0313 or Fax (403) 448-0315

Calling about an ad?
Say you saw it in

**PC Magazine
Marketplace**

DATA ENTRY

Perfect Replacement for Key-to-Disk Systems

ENTRYPOINT

Datalex

FEATURES

- Paint-the-screen form design
- Menu-driven edit selection
- Field and char type validation
- Range checks
- Table lookup
- Check digits
- Required fields
- Two-pass verification
- Default values and table retrieval
- Accumulator balancing
- Customizable error messages
- Programmable function keys
- Operator statistics
- LAN version
- Foreign character set

SUPPORT

- Toll-free support hotline
- 24-hour electronic bulletin board
- International distribution and support
- Award-winning manuals
- On-site training programs
- Design consultation

Application Analysis for Qualified Companies

800-962-8888
From Canada 1-800-848-5548
FAX 415-362-5733

KeyEntry III

- ☐ Replace dedicated data input systems
- ☐ Front-end mainframe applications
- ☐ LAN or stand-alone environments
- ☐ Screen Painter and MenuManager included
- ☐ Batch Control System and Reformat utility
- ☐ Spanish, German, and French versions
- ☐ Outstanding customer support
- ☐ Thousands of users worldwide
- ☐ OS/2 version

FREE 30-day evaluations available for qualified companies.

SCS
Southern Computer Systems, Inc.
2732 Seven Avenue South
Birmingham, Alabama 35233
(205) 251-2785 FAX (205) 322-4851
(800) 533-6879

DATA ENTRY

Why have over 85% of the largest companies in the U.S. selected the RODE/PC Data Entry System?

The answer will be obvious when you call for information and a free demonstration today.
(415) 323-8195

DPX
490 California Avenue
Palo Alto, CA 94306

CIRCLE 797 ON READER SERVICE CARD

DATA ENTRY SOFTWARE

HEADS-DOWN data entry and **TWO-PASS** verification. Fast and powerful, of course, but more importantly, **extremely easy to use.** Paint the screen formatting in minutes. On-line help text, edit language, batch control.

PC from \$395
Also for LAN's, IBM AS/400™, IBM S/36

FREE Trial

206/776-6443
800/356-0203

COMPUTER KEYES
21929 Makah Rd.
Woodway, WA 98020

ONE MAGAZINE DELIVERS THE BIGGEST MARKET OF PC BUYERS:

PC MAGAZINE

763,398

BPA Audit June, 1990

VIKING DATA ENTRY

Professional Quality Software

- Used by U.S. Census
- Advanced validation
- Sequential/ISAM files
- MS/DOS, UNIX, XENIX, VMS, AIX
- Technical support
- Re-key verify

Viking Software Services
4808 E. 67th St. Ste 100
Tulsa, OK 74136
918/491-6144 FAX. 918/494-2701

PC MAGAZINE

is #1 in classified ad lineage in IBM-Standard computer publishing. Join the winning team and place your ad.

Call (212) 503-5115 or (800) 825-4ADS

DESKTOP PUBLISHING

paperTamer™ brings the flexibility and convenience of image-based automated document storage and retrieval within the reach of everyone.

No special hardware needed, just your PC and scanner.

Economical, easy-to-use productivity software from:

FLAGSTAFF ENGINEERING
Call 800-346-3627

CIRCLE 798 ON READER SERVICE CARD

DIAGNOSTIC

PORT TEST

The most comprehensive serial & parallel port diagnostics available. Everything you need to test, debug, and manipulate ports—all in one program. Includes 3-way wrap plug. \$89

TEST DRIVE.

A complete Floppy Disk Drive diagnostic program. Pass/Fail or detailed reports. Can be used to align drives. Supports 360K-5¼", 1.2M-5¼", 720K 1.44M-3½". \$115 for one format, \$215 for all three. Alignment disks included. Money back guarantee. VISA/MC MicroSystems Development
4100 Moorpark Avenue M/S 104
San Jose, CA 95117 USA
(408)296-4000 FAX(408)296-5877

ENGINEERING

SIMULATION

GPSS/PC is a full-power version of GPSS, the most popular mainframe simulation language. Specially designed for interactive use on today's high-speed microprocessors, it is loaded with features such as interactive graphics and animation. Using GPSS/PC, you can predict the behavior of complicated real world systems.

MINUTEMAN SOFTWARE
P.O. Box 171/B
Salem, MA 01775
800-223-1430/508-897-5662 Ext 316

ARCHITECTS AND ENGINEERS

The AEMAS system is designed for Architects, Engineers & other firms where monitoring project costs is required. Modules include: Job Cost, Payroll, A/P, A/R, Invoicing, Personnel Scheduling, Report Generator and General Ledger. Runs on DOS, XENIX & NOVELL.

DATA-BASICS
11000 Cedar Road, Suite 110
Cleveland, OH 44106
(216) 721-3400

EDUCATION

Germany United! Soviet Union Divided!

Now... Millennium

puts today's headlines in perspective. Sit back and watch the evolving map of Europe as history flows across your PC's screen in dramatic colors. Or zoom in on any country in any year during the past 1,000 years to find out exactly what's going on.

"Fascinating, Fun, and Easy-to-Use!"

\$79

Clockwork Software (312) 327-6012
P.O. Box 14803h, Chicago, IL 60614 USA

CIRCLE 799 ON READER SERVICE CARD

ENTERTAINMENT/GAMES

Where Adults Come To Play!

ODYSSEY BBS

- Local Numbers, Covering 850 US Cities
- CB Style Group and Private Chat
- 1000's Of Shareware Programs
- Giant Message Forums
- Matchmaker Dating Database

- Interactive Multiplayer Games
- National Classified Ads

FOR FREE DEMO AND LOCAL NUMBER CALL
818-358-6968
BY MODEM, MUST BE OVER 18 3/12/2400.8/N/1

CIRCLE 800 ON READER SERVICE CARD

ENTERTAINMENT/GAMES



SeXXy Software

SeXXy Disk #1 — An unbelievable visual erotic encounter — MUST SEE!!
SeXXy Disk #2 — **NEW!** 3 Erotic encounter games for friends and lovers guaranteed to shed both clothes and inhibitions
SeXXy Disk #3 — An anatomical arcade game with unusual ammunition
SeXXy Disk #4 — 2 more incredible visual erotic encounters — impress your friends
SeXXy Disk #5 — Create your own erotic fantasies about friends and lovers
SeXXy Disk #6 — **NEW!** View print or edit ten sizzling pictures including celebrities

\$7 each, any 3 for \$17, or all 6 for \$32. for IBM & compat. CGA, EGA or VGA graphics req'd

ADD \$3 S/H • 3.5" OR FOREIGN ORDERS ADD \$2 PER DISK • IN PA ADD TAX.
VISA/MC Orders only 800-243-1515 Ext. 600CV

24 HOURS / 7 DAYS • MUST STATE AGE OVER 21

Or check/MO to: SeXXy Software, 2880 Bergey Rd., Dept 600CV, Hatfield, PA 19440

THE BEST IN ADULT SOFTWARE FOR LESS!!
THE COMPETITION ISN'T EVEN CLOSE!!

CIRCLE 801 ON READER SERVICE CARD

CONNOISSEUR COLLECTION ALL NEW! In 256 Color VGA!!

SeXXy Disk #CC1 — ★ YOU BE THE STAR ★
 The FIRST CUSTOMIZABLE movie allows you to write the dialog and the title. You can star with the partner of your choice. Incredible scenes display with your dialog. ONLY AVAILABLE FROM US!
SeXXy Disk #CC2 — THE FIRST SOUND MOVIE!
 The first computer erotic movie with SOUND. See the incredible 256 color VGA graphics while hearing the actual dialog. OURS EXCLUSIVELY!
SeXXy Disk #CC3 — THE BEST MOVIE!
 The best computer movie available. Only for the serious collector. 256 stunning VGA colors.

1 Set - \$29, 2 Sets - \$49, 3 Sets - \$65
 All CC Disks Require VGA monitor and hard disk — over 1 MB of action.

Graph-XXX
 We've seen the rest... We're the BEST

Must state age over 21
 STARWARE PUBLISHING CORP
 P.O. Box 340203 - Dept. 2
 Boca Raton, FL 33434

CIRCLE 803 ON READER SERVICE CARD

Adult VGA Software

Visualize the full potential of VGA and SVGA.

Hi-res, 256 color images

Vol. 1 **Sexy** (6 disks per vol.) \$13.95
 Vol. 2 **Nude** \$13.95
 Vol. 3 **More Nude** \$13.95
 Vol. 4 **Adults Only** \$13.95

Hi-res VGA animation. Just like the movies!!

Vol. 5 **Adult VGA Movies** \$13.95
 Vol. 11 **Hot Italian Movies** \$13.95
 Vol. 12 **Long Length Movies** \$13.95

Special Order 4 volumes, select 5th free!

Choose from six 5 1/4" DD disks, (three 5 1/4" HD (best deal), three 3 1/2" DD, or two 3 1/2" HD for each vol. All disks are full. Vol. 12 available in only HD disks.

Get more great software for less. Guaranteed. Fast service. Order today. Include \$3 S/H. Must state age 21 or over. Send check or MO to:

CJCware
 For free catalog call: Station A, P.O. Box 2299
 (217)352-7430, Champaign, IL 61825

CIRCLE 804 ON READER SERVICE CARD

**ONE MAGAZINE DELIVERS THE BIGGEST
 MARKET OF PC BUYERS: PC MAGAZINE**

763,398

BPA Audit, June, 1990

FINANCIAL

When You Must Be Accurate!

Loan Amortization Software

Used worldwide by banks, credit unions, S & L's and attorneys

\$79.95

MINI-AMORT™

- ☐ Prints Amortizations
- ☐ Fixed or Adjustable Rate
- ☐ Irregular Payments
- ☐ Recurring extra payment
- ☐ Balloon Payment
- ☐ Easy Menus & Helps
- ☐ Solve for an Unknown
- ☐ Present Value, Future Value
- ☐ 18 Digit Accuracy
- ☐ 360, 365, or 360/365 day interest computations
- ☐ File store & retrieve
- ☐ *Demo Disk Available

\$149.95

EXEC-AMORT™

- ☐ Over 5000 Sold Worldwide
- ☐ Includes all the features of Mini-Amort™
- ☐ Prepaid Interest
- ☐ Points and Fees
- ☐ Calculate and print APR's that comply to US Rules Regulation Z, Truth in Lending specifications
- ☐ Yield & Loan Price
- ☐ Long/Short period interest
- ☐ No Spreadsheet Required
- ☐ Fully Self Contained
- ☐ *Demo Disk Available

\$79.75

ZIPPY™ Mail List

- ☐ Names, Address & More
- ☐ Search, Update & Print
- ☐ Zip Code Sorting
- ☐ Save on Bulk Mailing
- ☐ Fully Self Contained
- ☐ No Programming Required

\$49.95

THI-Res Graphics

- ☐ For most Toshiba Laptops that support 640x400 graphics
- ☐ 640x400 AT&T compatible Graphics

Order Today! Call 800/858-8448

Technical Support Call 313/791-0770

FAX Orders: 313/791-3010

Network, Site License and Corporate prices available.
 Visa, MC, Amex & Discover, COD's add \$3.30, \$5 Ground, \$13 Air Shipping.
 International Add \$15 Shipping. *Demo Disk \$5 each plus shipping

ELECTROSONICS, 36380 Garfield - #1, Fraser, Mich 48026
 60 day money back guarantee on full product.

CIRCLE 806 ON READER SERVICE CARD

"BrainMaker Professional is the kind of software that makes computers exciting."

Editors Personal Best of 1990 John Dvorak PC Magazine
 Learns from your data to predict Sales, Stocks, Sports, etc.
 Reads in from Lotus, dBase, Excel, ASCII, binary. Easy to use: menus, color, graphics, thorough manuals.

California Scientific Software

10141 Evening Star Drive #6, Grass Valley, CA 95945
1-800-284-8112

\$795

CIRCLE 807 ON READER SERVICE CARD

FINANCIAL

LOAN MANAGER



SIMPLE, EASY TO USE,
 YET COMPREHENSIVE
 MENU DRIVEN
 LEARN IN MINUTES
 VARIABLE, PARTIAL, OVER PAYMENTS
 ETC.

MONTHLY, QTR, SEMI-ANN, ANNUAL;
 PAYMENT BOOKS, AMORT. SCHEDULES,
 MONTHLY INCOME STATEMENTS,
 ACCOUNT LEDGER, LATE NOTICES,
 REPORTS AND MORE!

\$895 WITH 30 DAY MONEY BACK
 GUARANTEE. NETWORK VER. AVAIL.

1-800-245-6096

COMPUTER SERVICES UNLIMITED
 SOFTWARE DIVISION
 P.O. BOX 863
 MOUNTAIN HOME, AR 72653

CIRCLE 805 ON READER SERVICE CARD

CHECK MANAGER

An easy to use Check Register Program. This is one program you will use all the time. Very easy entry of expense records and very easy retrieval of all information. Simple readable, accurate. Keep as many different check files or accounts as you have disk space. Easy Easy you will use this one. \$49

COMPUTECH

621 Appleblossom Lane
 SPARKS, NV 89433
 702-673-1989

FLOWCHARTING

WINDOWS FLOWCHARTER \$129

RFFlow 2.0 is a professional drawing tool for flowcharts and org charts. Requires Microsoft Windows 3.0. 100 shapes auto adjust in size. Diagonal lines and curves. Auto line routing and re-routing. Click on a shape to bring up a sub-chart. Move charts to other apps. via the Clipboard. Call for free trial disk.
RFF ELECTRONICS
 1053 Banyan Court
 Loveland, CO 80538
 Phone 303-663-5767 FAX. 303-669-4889

FOREIGN LANGUAGES

Diplomat Software, Inc.

Alphabets Of The World For Your PC



Series of 36 alphabets providing both English and foreign characters for screen, keyboard and printer support while using existing software.
WordPerfect, Word, WordStar, Quattro Pro, Ventura Publisher, Works, dBase ... more.

Diplomat Software, Inc.
 3700 Campus Drive, Suite 202, Newport Beach, CA 92660
 Phone (714) 424-6666 Fax (714) 424-6617

CIRCLE 808 ON READER SERVICE CARD

FOREIGN LANGUAGES

CIAO!

IBM TUTORIALS FOR LEARNING LANGUAGES!

- VOCABULARY TUTOR •
- PRONUNCIATION TUTOR •
- TENSE TUTOR •

• SPANISH • FRENCH • ITALIAN • GERMAN •

MOST PRODUCTS FEATURE EXTENSIVE DIGITIZED SOUND!

CALL TOLL-FREE TODAY

FOR OUR FREE CATALOG!

1-800-726-5087

THE HYPERGLOT SOFTWARE COMPANY
505 Forest Hills Blvd., Knoxville, TN 37919

CIRCLE 609 ON READER SERVICE CARD

GRAPHICS

GRAFPLUS

Grafplus™ turns any IBM or compatible graphics application into a powerful communications by printing exactly what you have created on your computer screen. Only \$59.95.

- Link into Pagemaker or Ventura
- Scale the image to any size
- Print in color, black-on-white, white-on-black, vertically or horizontally
- Supports 256 colors
- Work with virtually any bit-mapped dot matrix, laser or inkjet printer
- Linkable/OEM version available



Jewell Technologies, Inc.
4740 44th Ave. S.W. Suite 203
Seattle, WA 98116
1-800-284-2574

CIRCLE 810 ON READER SERVICE CARD

RAINDROP™

FAST, compact PntScrn Utility for end users AND developers. Hardcopy as fast as 10 secs. Average binary size 6kbytes. 14 video graphics standards. Scale, rotate, colorize & more. 'Call' from user written programs. Complete 9 & 24 pin dot matrix, ink jet & laserjet library \$44.95. VISA/MC.

Eclectic Systems
8106 St. David Ct.
Springfield, VA 22153
703-440-0064

PEN PLOTTER EMULATOR

FLOT turns your printer into an HP pen plotter. Fast hi-res output, no jagged lines. Vary line width, color. Screen preview with zoom and pan. Works with most CAD and graphics programs. Supports most printers. New version 3 \$119+\$3 S&H 30 money back. VISA/MC/Check/MO.
FLOT Corporation
24-16 Steinway St., Suite 605
Astoria, NY 11103
(718) 545-3505

GRAPHICS

Try Us Free!

Slides From Your PC

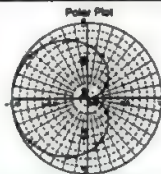
We want your business. And we'll prove it! We offer the best service available. Experts in Harvard, Freelance, Corel and others on staff to serve you. Free Federal Express shipping. Toll-free Customer Service. And if you should make a mistake, we'll reshoot your slides, free. Call today, and say "I'd like to try your service. Free."

1-800-222-2592



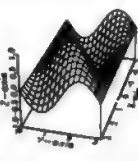
Accent Presentations, Inc.

12780 High Bluff Drive, Ste. 250 • San Diego, CA 92130



"All the C Language routines you need to write an impressive scientific graphing program of your own."
Highly recommended—PC Magazine

Scientific Endeavors
506 N. Kentucky St., Kingston, TN 37763
(615) 376-4146 FAX: (615) 376-1571



CIRCLE 811 ON READER SERVICE CARD

COMPUTER IMAGES



Super VGA

Also VGA/EGA/HGC/CGA and Animation

1024 x 768 x 256

Photographic Quality Real Color Images
ASTRONOMY • NATURE • SCENIC
FULL COLOR VIDEO MOVIES
HUGE ADULT SECTION • HEAVENLY BODIES

You must be at least 21 for adult images
Now you can experience your computer's maximum graphics ability!

GIF images for IBM, MAC II, Amiga, Atari and most other computers in your favorite GIF resolutions. EGA to VGA 120x200x256 to SVGA 1024x768x256 and all resolutions between

TWO WAYS TO BUY OUR IMAGES

32 hour BBS: 903-497-5100 • You'll have full unlimited access to 1400 megabytes of images and programs on our 24 hour 32-line BBS. Only \$10/hr., no uploading required, no time limits. No charge to look around. Call for 9600 baud numbers.

Must be 21 for adult areas. Buy time online with credit card on the world's largest Online Graphics System!

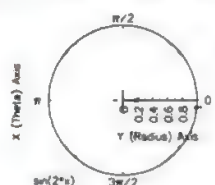
CATALOG MAIL ORDER: 503-497-7700
Save long distance phone charges. Order anything found online through our Mail Order Catalog. World-wide shipment. Credit card, cash, check. Same day shipment. U.S. Mail. UPS. FEDEX, anywhere.

Event Horizons
311 B Ave.
Suite 208
Lake Oswego, OR 97034
Information 503-697-7700



CIRCLE 812 ON READER SERVICE CARD

CoPlot Scientific Graphics Software



CoPlot is part of our full line of software for scientists and engineers.
CoStat - for statistics.
CoPlot - for scientific graphs.
CoDraw - for technical drawings.
\$99 each or \$259 for all three.
John Dvorak says: "Don't let the low price fool you; this is excellent software."

CoHort Software (415) 524-9878
P.O. Box 1149, Berkeley, CA 94701
(This ad was created with CoPlot.)

CIRCLE 813 ON READER SERVICE CARD

COMPUTER
\$595
SLIDES

SLIDES FROM YOUR FILES

IMAGE CENTER

1011 Second St. S.W. • Richmond, VA 23066

1-800-433-8829

CIRCLE 899 ON READER SERVICE CARD

INVENTORY

dFELLER INVENTORY

A business inventory program written in modifiable dBASE source code. The menu-driven program lets you locate items by inventory name or number. It keeps track of reorder points, vendors, average cost & other information.

"dFELLER Inventory \$150/Requires dBASE II/III"

"dFELLER Plus \$200/with History & PO's"

Requires dBASE III-III PLUS (for stock rooms)

FELLER ASSOCIATES

550 CR PPA, ROUTE 3

Ishpeming, MI 49849

906) 486-6024

INVENTORY MANAGEMENT

Stock-Master 4.0, commercial grade system provides Stock Status, Purchase Order Writing & Tracking, Trend Analysis, Quality Control Reporting Detail Analysis, Bill of Materials, Multi Locations and more. Modular, "micro" priced & configured to your needs. Cobol Source available. APPLIED MICRO BUSINESS SYSTEMS

177-F Riverside Ave.
Newport Beach, CA 92663
(714) 759-0582

MAILING PROGRAMS

Today's PC Mail System

Fast! Accurate! Large volume mailers use Post-Ware software programs to: standardize & correct addresses; add ZIP, ZIP + 4, Car.Rt.; presort 1/2/3 Class, detect duplicates; print Postnet bar codes; palletize 2/3 Class; and quality for postal discounts. CASS certified. Reported throughput over 100,000/hr.

Postalsoft, Inc.
4439 Mormon Coulee Rd.
La Crosse, WI 54601-8231
608/788-8700 (WI) or 800/831-6245

The Mail Order Wizard

is one very powerful program. It offers a catalog business all the computing routines it needs—and then some!...gives new meaning to the hackneyed phrase, "user friendly"...Written in Assembler, it operates with lightning speed...very serious software, a must see "Catalog Age, \$1,670. Demo, \$20.
The Haven Corporation
802 Madison Dept. M
Evanston, IL 60020
(708) 869-3434 or (800) 782-8278

MAIL ORDER MANAGER (M.O.M.)

The complete solution for the mail order business—order entry/review, credit card processing, UPS manifesting, profit analysis, accounting. Clipper compiled, dBase III + files. Inbound/Outbound Editor's Choice—find out why more people buy M.O.M. after comparing us to the competition. Single user \$1195. Networks from \$2295. Demo \$25 refundable. Dyadcomp Development Corp.
P.O. Box 641
Wayne, NJ 07474-0641
(201) 694-0779

MUSIC

MUSICPRINTER Plus 4.0 *New MIDI*

MUSICPRINTER Plus is the acclaimed musical notation and MIDI performance program that gives you flexibility & power. With real time MIDI input as one of your options, it's even quicker & easier to use. MUSICPRINTER Plus gives you total control over the musical performance & score.

Temporal Acuity Products, Inc.
300-120th N.E. Bldg 1 • Bellevue, WA 98005
(206) 462-1007 • 1-800-426-2673

CIRCLE 814 ON READER SERVICE CARD

Beautiful

L-M-P Laser Music Processor

WISYWIG desktop music scoring on your IBM PC/AT, for the HP-LaserJet/Epson FX/IBM Proprinter printers, VGA/EGA/MCGA/Hercules/CGA/AT&T displays, MIDI transcription, full mouse support and options for PCX files & Deskjet emulation, and much more!

TEACH Services (518) 358-2125
182 Dayton Rd. Bushkill, New York 12916
865 (518) 358-3352 (SHIPPING \$6.95 US, NY + 7% TAX)

\$99.95

CIRCLE 815 ON READER SERVICE CARD

Recording Studio in a PC? Piece of Cake.

Cakewalk, the 256-track MIDI sequencer, lets you record, edit, and play back music using a MIDI-compatible instrument. Designed for both musicians and PC hobbyists alike. It's a PC Magazine Editor's Choice! The #1-selling MIDI sequencer for the IBM PC. Only \$150.

Get a Piece.
Call 800-234-1171 and ask for our free catalog.
Full line of MIDI software and interfaces available.

Twelve Tone

P.O. Box 760, Waterville, MA 02722 (617) 273-4437

CIRCLE 802 ON READER SERVICE CARD

SONGWRIT V MUSIC PROCESSOR

Prints professional sheet music, songs, scores with text, chords, dynamics. Compose, edit, record, play, transpose, copy, extract, import, publish - all in standard notation. Symbol editor/librarian. PC, MIDI or SMF entry & playback. Matrix/laser printers. \$99.95 + \$5 s/h. Free sample output.

SONGWRIT SOFTWARE
7 Loudoun Street, S.E., Suite 5A
Leesburg, VA 22075
(703) 777-7232

PREVENTATIVE MAINTENANCE

MAINTENANCE & INSPECTION

An easy-to-use computerized method to organize, operate, and control an effective preventive maintenance system. Applicable to any type of business or industry. Full screen input and displays, plus function key help command. Maintains historical data, creates work orders, and provides numerous reports. For info, write to:

PENGUIN COMPUTER CONSULTANTS
P.O. Box 20485
San Jose, CA 95160
(408) 997-7703 FAX 408-927-0570

FLEET/EQUIP MAINTENANCE

A preventive maintenance & report generating a system for vehicles/equip that require periodic maintenance. Some features: Work orders, User defined coding; Cost per mile/hr reports, PM reports; Scheduled maintenance reports & warning, Service history, Gas/Oil history, Parts/Cost, Oil analysis results reporting.

RAM Systems Inc.
224 Causeway Blvd
La Crosse, WI 54603
608-782-8130 FAX 608-784-5115

Personal Composer 3.3

"The most elaborate and powerful professional music software available" - *Musician Magazine*

Every composing, MIDI, and music desktop publishing tool in one package.

\$395.00
introductory offer
Call 1-800-446-8088 for info

CIRCLE 816 ON READER SERVICE CARD

PROGRAMMERS TOOLS

LAHEY FORTRAN

- F77L-EM/32 - write/port 4GB, 32-bit 80386, Debugger, Editor, Graphics. Virtual memory, Free runtime
- F77L - Industry leader - loaded
- LP77 - New release, ANSI 77, Editor, Debugger - only \$99 • See our Display ad

TEL: (800) 548-4778 or (702) 831-2500
Lahey Computer Systems
P.O. 6091
Incline Village, NV 89450
FAX: (702) 831-8123

PROGRAMMERS TOOLS

FREE BUYER'S GUIDE

Call or write for your **FREE** comprehensive Buyer's Guide which contains descriptions of over 1200 software products from more than 440 manufacturers, plus informative articles by some of today's industry experts. Programmer's Connection has supplied the professional programmer since 1984 with quality products by offering unbiased advice, low prices, fast delivery and no hidden charges.

Programmer's Connection
7249 Whipple Ave. NW
North Canton, Ohio 44720

USA 800-336-1166
Canada 800-225-1166
International 216-494-3781
FAX 216-494-5260

CIRCLE 817 ON READER SERVICE CARD

SOURCER™ 486

COMMENTING DISASSEMBLER

Sourcer creates detailed commented source code and listings from memory. COM files or EXE files. Data analyzer and simulator resolves multiple data segments and provides detailed comments on interrupts, I/O ports and much more. New release supports 8088/87 to 80386/87, 80486, and V20 V30 instructions. BIOS Pre-processor generates commented listings for any BIOS. "Sourcer is the best disassembler we've ever seen." PC Magazine, 1.17.89, page 101.

Sourcer New Version 3.0	\$129.95
BIOS Pre-Processor - (Requires Sourcer)	\$49.95
Unpacker - Unpack EXE files	\$39.95
ASMtool - 486 Source code analyzer	\$199.95
View-It - Zoomable file viewer	\$69.95
ASM ProPak - If All above (save \$90)	\$399.75
Sourcer w/BIOS (save \$10)	\$169.95

SAH USA \$55 Can/Mex \$10 Other \$15 CA Res. add tax

1-800-648-8266
V COMMUNICATIONS, INC.
4320 Stevens Creek Blvd., Suite 275 Dept. PC
San Jose, CA 95129 • (408) 296-4224

PUBLIC DOMAIN

FREE IBM SOFTWARE CATALOG

Detailed Descriptions

1000's of Great Programs
Only \$2.99 per Disk
Carefully Selected
Fully Tested
Includes Exclusive
5 FREE disk offer

THE SOFTWARE LABS
3762 Overland Ave. Ste. 112
Los Angeles, CA 90034

1-800-359-9998

CIRCLE 818 ON READER SERVICE CARD

PUBLIC DOMAIN

SOFTSHOPPE, INC.
ASP Member

- Selected Programs
- Latest Versions
- As Low as \$1.50

FREE CATALOG
IBM PD/SHAREWARE
POB 3678, Ann Arbor, MI 48106

Call 800-829-BEST (2378)
or 313-761-7638
Fax 313-761-7639

CIRCLE 819 ON READER SERVICE CARD

PSL **Public (software) Library**

The best organized, most comprehensive, most up-to-date... - PC Today

...Extravagant service... - Whole Earth Review

Call for a free newsletter:
800-2424-PSL 713-524-6394

Member - ASP

CIRCLE 820 ON READER SERVICE CARD

REAL ESTATE

MANAGEMENT & ANALYSIS

"Real Property Management" \$395/\$595 for residential & commercial properties and other bkkp'g. Flags delinq't tenants; prints budgets, checks, invoices & 1099S. No retyping of recurring data. "Real Analyzer," \$195, when deciding: buy/sell, exchange, or refinance. 30 day money back guarantee.

REAL - COMP., INC.
P.O. Box 1210
Cupertino, CA 95015
(408) 996-1160

CREATIVE REAL ESTATE DEALS

Profit from OUR experience! Agents/Investors can earn top income during good or BAD times! Since 1971 we've done 100's of options, lease options, equity sharings, buy/sell notes & many other profitable deals. DETAILED in new 160 page "how-to" book. ALL forms, templates on 5.25 IBM disks. Guaranteed Only \$149 + s/hp.

GARDINER INVESTMENTS
8620 Christy Lane
Roseville, CA 95661
(916) 797-0444

REAL ESTATE

continues on the next page.

REAL ESTATE

Comtronic Property Manager™

COMMERCIAL-RETAIL-RESIDENTIAL

PC, Network & Multi-Site systems manage unlimited properties. Complete G/L with A/P & A/R. Rent Roll, Owners Statements, Reports, Notices, Checks, Invoices, Receipts & 1099's. Demonstration only \$40.

Find out more!

206-874-4034

Comtronic Systems, Inc.
33305 First Way South, Suite 210
Federal Way, WA 98003

CIRCLE 822 ON READER SERVICE CARD

To place your ad in

**PC MAGAZINE
Marketplace**

Call **(212) 503-5115**
or **(800) 825-4AD3**

PROPERTY MANAGEMENT

Rental-Ease: New state of the art property management software. Extremely fast and easy to use. Everything is included, tenant tracking, repairs and maintenance, income and expense, check writing. No extra modules to buy. The ultimate in property management \$695 complete. Free brochure, Demo \$10. STRATEGIC OFFICE SYSTEMS
688 North 500 West #61
Mt. Pleasant, UT 84647
800-942-6784 or 801-462-2130

PROPERTY MANAGEMENT

Comprehensive software for managing residential, commercial, condos, and more. Three versions: Basic PM for owner/manager—\$495, Deluxe PM for professional management—\$1,195, Multi-User with Novell network compatibility—\$2,395. Includes check writing, recurring expenses, G/L, management reporting. YARDI SYSTEMS, INC.
813 Reddick St.
Santa Barbara, CA 93103
805-966-3666

RELIGION

10th Anniversary Celebration!



Ten years at the top! Version 5.0 VERSE SEARCH now offers full mouse support, unlimited windows and instant access to every word or verse. Our family of Bible study products includes: NIV, RSV, KJV or NKJV text, Bible Concordance, Bible Dictionary, Thesaurus, Chain References, Personal Commentary, Greek / Hebrew transliterators, Topical Bible, Chronological Bible. Memory resident VERSE TYPIST transfers verses directly to your word processor. Our \$5 demo disk shows why we have sold more products than any other Bible program!

Bible Research Systems • 800.423.1228

2013 Wells Branch Parkway #304 • Austin, Texas 78728

Tech Support (512) 251-7541

Call for a free Catalog.

Subscription Overseas

CIRCLE 824 ON READER SERVICE CARD

CHURCH SOFTWARE

Discover for yourself why more churches are choosing **Power Church Plus**™. Try out the leading membership and accounting package. Call today for your **FREE** full-working DEMO.

F1 SOFTWARE, 6300 Varrel Avenue, Suite H, Woodland Hills, CA 91367
(818) 888-1800

CIRCLE 821 ON READER SERVICE CARD

SALES MARKETING

CLIENT & SALES MANAGEMENT SOFTWARE

"Totall Manager is one of the finest, possibly the best, of all sales and marketing management programs... in my opinion, it is very much the way to go!"
Business Marketing, July, 1989

FREE
Totall
Manager
DEMO

1-800-777-6368

BARTEL

948 E. 7145 S., Suite C-101, Midvale, UT 84047 (801) 566-5544

CIRCLE 823 ON READER SERVICE CARD

SALES ALLY Call 215-836-1830!

Sales & Marketing Software for the Sales Professional
Account Mgmt, Track Leads, Direct Mail, Forecasts, Reports, Orders, Scripts, Statistics, Competition, LAN, Field Sales, Autodial, Letters, Notes & MORE!
Scherrer Resources 8100 Cherokee St, Phila, PA 19118

FREE Information!

CIRCLE 796 ON READER SERVICE CARD

PC
MAGAZINE
Editor's
Choice

Did you know...

On average, PC Magazine's direct market purchasers have spent—
• \$30,000 on hardware
• \$5,400 on software
• \$2,100 on accessories
• an average of \$2,855 per order

PC Magazine is exclusively read by over 763,398* business buyers and brand specifiers, including 90,000 computer resellers and consultants.

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts. Call your PC Magazine Marketplace Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

Source: Beta Research Study, 1988
*BPA Audit June, 1990

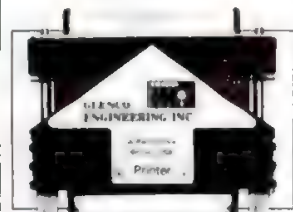
SECURITY

STOP SOFTWARE PIRACY

With our Copy Protection Products. They really work and do not burden the honest user...

For Hardware Based Security
(Parallel Port Interface)

- STANDARD KEY
Unlimited executions
- COUPON KEY
Limited executions
- READ/WRITE KEY
Field programmable memory
- DURATION KEY TAG
On-chip clock for leases



For Disk Security

High Level Security
With hard disk install/uninstall included

- PADLOCK II DISK
- COUPON DISKS

Low Level Security
User Installable Protection

- PC-PADLOCK

The market is filled with copy protection products which burden the user or simply don't work. We have over 3500 satisfied software firms utilizing our systems. The high-level fingerprint has not required an update in over 3 years.

Call or write for more information.

GLENCO ENGINEERING INC.
SERVING THE SOFTWARE INDUSTRY SINCE 1979
800-562-2543

270 Lexington Dr. (708) 808-0300
Buffalo Grove, IL 60089-6930 FAX 808-0313
CIRCLE 825 ON READER SERVICE CARD



SOFTWARE OR HARDWARE TO PROTECT YOUR \$\$\$\$ PROFITS \$\$\$\$

Since 1986 thousands of companies worldwide have chosen Az-Tech Software as partners in their fight against Software Pirates. Why? Because Az-Tech has offered them:

EVERLOCK SOFTWARE COPY PROTECTION
EVERTRAK SOFTWARE SECURITY
EVERKEY HARDWARE PROTECTION

The ALL IN ONE device that offers:

- REMOTE RESETS
- SERIALIZATION
- DATE EXECUTE LIMITS
- COMPRESSION
- and much, much more



These products are easy to use and most important, they work! No one in the market place can offer you the Flexibility, Ease of Operation, or Degree of Protection that You receive with Az-Tech products.

Call Today for a FREE Demo
800-227-0644



Az-Tech Software, Inc.
Security Products That Work

305 East Franklin • Richmond, MO 64085
(816) 776-2700 • FAX (816) 776-8398
CIRCLE 826 ON READER SERVICE CARD

SOFTWARE COPY PROTECTION

- Installs easily on your IBM-PC software
 - Defeats all disk copy software
 - Supports all Hard & Floppy disk formats
 - Requires NO special devices or disks
 - Invisible to your end user
- Eval. disk protects 2 disks \$25
Starter kit protects 100 disks \$99
- L-Tech Corporation
377 Route 17 South, Suite 618
Hasbrouck Heights, NJ 07604
(201) 288-1608 BBS 201-288-8795(8/N-1)

BIT-LOCK SECURITY

Privacy SURVIVAL 8 YEARS proves effectiveness of powerful multilayered security. Rapid decryption algorithm. Device transparent to PARALLEL or SERIAL port. Complemented by low cost KEY-LOCK™ multifunctional COMPU-LOCK™ Countdown, timeout, data encoding, multi-product protection, DOS/UNIX. Access control MICROCOMPUTER APPLICATIONS
3167 E. Otero Circle
Littleton, CO 80122
(303) 770-1917

SOFTGUARD Copy Protection

Manufacturers depend on Softguard Copy Protection Systems to protect their software. **SuperLock™** and **TrialDisc™** features include:

- IBM PC, compatibles, and Macintosh
- Invisible to End Users
- Hard Disk Support
- No Source Code Changes Required
- LAN Support

For more information, or to order, call
415-651-5580/FAX 415-651-7814

Datapath

CIRCLE 827 ON READER SERVICE CARD

STATISTICS

Power Designed to Fit Your Needs

MINITAB is the easy-to-use statistical package that lets you master a broad range of functions within one hour.

- Basic Statistics
- Regression
- Control Charts for SPC
- Hi-Res Graphics
- Time Series
- ANOVA and ANCOVA

...and more
CALL 800-448-3555
MINITAB
STATISTICAL SOFTWARE
Minitab Inc.
3081 Enterprise Drive / State College, PA 16801

CIRCLE 829 ON READER SERVICE CARD

NCSS 5.x Series - \$125

Easy-to-use menus & spread sheet Multiple regression, T-tests, ANOVA (up to 10 factors, rep. measures, covariance), Forecasting Factor, cluster, & discriminant analysis, Nonparametrics Cross Tabulation, Graphics, histograms, box, scatter, etc. Reads ASCII/Lotus. Many new add-on modules

NCSS
329 North 1000 East
Kaysville, UT 84037
Phone: 801-546-0445 FAX 801-546-3907

STATISTICS

STATISTICA

CSS/3 Complete Statistical System with data management and over 1,000 fully integrated presentation quality graphs, the largest selection of statistics, graphics available in one package. unlimited size of files, menus, mouse or commands. IBM compatibles \$595.

Quick CSS All basic statistical modules of CSS 3 (incl. data management) and the full presentation-quality graphics capabilities of CSS 3. IBM compatibles \$295.

CSS:GRAPHICS The largest selection of graphs in one package, all graphics capabilities of CSS 3 and, in addition, extended on-screen drawing facilities, inserting, multi-graphs, rotating 3D graphs, (40 types) with interactive cross sections, special effects, custom designed graphs. IBM compatibles \$495.

STATISTICA A fully integrated system that combines all the capabilities of CSS 3 and CSS GRAPHICS into a single, extremely comprehensive data analysis package. IBM compatibles \$795.

STATISTICA/Mac A CSS-compatible data analysis and graphics system with data management for the Macintosh (3D rotation, on-screen drawing), unlimited size of files. Macintosh computers. \$395.

Domestic ship \$7. 1-yr. money back guarantee



StatSoft™

2325 E. 13th • Tulsa, OK 74104 • (918) 583-4149 • FAX (918) 583-4376

StatSoft of Europe (Hamburg, FRG) 040 4200347
StatSoft UK (London, UK) 0438 310056
StatSoft Pacific (Melbourne, Australia) 613-497-4755

CIRCLE 828 ON READER SERVICE CARD

SURVEYS

THE SURVEY SYSTEM

An easy to use menu driven system for the entry, editing, processing and presentation of questionnaire data. The system can produce camera ready cross-tabs and other tables in banner format. Also statistics and graphics. Regression and open-end coding/analysis options available. CREATIVE RESEARCH SYSTEMS
15 Lone Oak Cir., Dept. P
Petaluma, CA 94952
(707) 765-1001

TAXES

W2/1099 Software

Major companies and CPA's rate our software tops! Create forms on HP LaserJet or use any preprinted forms. Creates IRS ready diskettes. Convenient data entry or import from any other software. W2 & all 1099's. Easy to learn & use - great support! (Programmers - ask about our Laser Forms Toolbox) \$129.00
Newport Wave Software
10 Savannah
Irvine, CA 92720
(800) 999-2611 (714) 544-1099

TAXES continues on the next page.

TAXES

Get Your 1990 TaxBreak today!

With pull-down menus and familiar tax forms on the screen, TaxBreak makes tax preparation easy and fast. TaxBreak takes you through the process step by step. It supports 1040, 1040ES, 1116, 2106, 2119, 2210, 2210F, 2441, 3468, 3800, 3903, 4136, 4137, 4255, 4562, 4684, 4797, 4952, 4972, 5329, 6251, 6252, 8283, 8606, 8615, 8814 and schedules A, B, C, D, E, F, R & SE.

Digital Frontier Corporation, PO Box 173, Westford, Massachusetts 01886

Tel: 1-800-34-TAXES

Fax: (617) 861-1037

Price \$29.95

Computer: IBM, 640K RAM, hard disk.

CIRCLE 830 ON READER SERVICE CARD

AM-TAX

The fast, easy, accurate way to prepare your 1990 tax return.

Personal-1 Version: (IBM w/256K) Calculates 1040, A thru SE, 2106, 2119, 2210, 2441, 3903, 4562, 6251, 8615, 8814. All printed forms (incl 1040) appr by IRS.

Only \$40

Personal-2 Version: (IBM w/320K) Calculates more forms (all above plus 1040A, 3800, 4136, 4137, 4255, 4684, 4797, 4835, 5329, 6252, 8283, 8582, and 8606).

Only \$65

State programs for CA, MD, MO, NY, NJ, OH, IL and VA. Data auto-transferred from federal tax forms. \$30 each.

Professional Version with client letters and billing (\$125), **Laser Forms** (\$100), and **Electronic Filing** (\$395) are available.

MasterCard & Visa accepted.

AM SOFTWARE
P.O. Box 25010
Kansas City, MO 64119
MC/VISA (816) 426-8361
FAX (816) 452-3183

CIRCLE 831 ON READER SERVICE CARD

UTILITIES

BREAK 640K!

VRAM™ (\$49 + 4sh) creates 32M of memory by turning disk space or extended memory into expanded! VRAM/plus (8 utilities/\$99 + 5sh) HRAM creates 944K DOS memory, min-mem frees memory used by TSRs. Diskpack backs up 10M to 2 disks. COMx connects PCs (w/321 cable), and more 30-day grt Biologic 7950 Blue Gray Circle Manassas, VA 22110-2829 703-368-2949 (703-361-8251 fax)

UTILITIES

LIMSIM

Expanded Memory Simulator for 286, 386, 486, & 286 NEAT machines. Use the extended memory you already have as Lotus style Expanded Memory. PC Magazine says "Easy to use and well documented." \$80. 30 day money back guarantee. Visa/MC accepted. Larson Computing 1556 Halford Ave #142 Santa Clara, CA 95051 (408) 737-0627

WINDOWS

PERSONAL MEASURE

Finds performance bottlenecks in PCs. "can enhance anyone's diagnostics artillery documentation is exemplary." W. Rosch, 8/89 PC Magazine. NOW measure and tune Windows 3.0 apps! Most major LANs. Clear graphs and statistics show how your apps spend time \$125 + S&H (5.25" or 3.5") MC/VISA SPIRIT OF PERFORMANCE, INC 73 Westcott Road Harvard, MA 01451 508-456-3889 telex 6503571400

WORD PROCESSING

عربي، 'Ελληνικά, עברית

Русский, Farsi, English, European & Scandinavian; plus either IPA, Hindi, Bengali, Gurmukhi, Tamil, Thai, Korean, or Viet. Full-featured word processor supports on-screen foreign characters and highest quality printing with no hardware modifications. Includes Font Editor. \$355 incl. US shipping \$150 add'l for laser. \$19 demo. Reg. 640k, graphics. Money back guarantee.

Gamma Productions, Inc., 710 Wilshire Blvd., Ste 609, Santa Monica, CA 90401 (213) 394-8622. MC/VISA/AMEX.

CIRCLE 832 ON READER SERVICE CARD

Calling about an ad? Say you saw it in
PC Magazine Marketplace

MISCELLANEOUS/ACCESSORIES

COMPUCOVER® COVER YOUR INVESTMENT



Computer Dust Covers

Spill Proof!! Anti-Static!! Our Stylishly fitted Dust Covers will look good on your computer and give maximum protection from dust and spills. Avoid expensive repair and downtime. Over 4,000 designs available in Nylon or Clear Plastic. Check our Prices!!

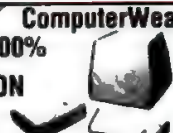
Dealer Inquiries Invited

USA (800) 874-6391 Fax (904) 863-2200
FLA (800) 342-9008 (904) 862-4448

2104 Lewis Turner Blvd. (Dept PCM)
Fort Walton Beach, FL 32548 MC

CIRCLE 833 ON READER SERVICE CARD

DUST COVERS 100% COTTON CANVAS



Breathable! Static-Free! Beige with Gray Trim For Computers, Keyboards, Printers & Lasers All Popular Models. Superior Quality. Best Price

NEW! VizIFlex-Seals SKINS for Keyboards



1-(800) 826-5761

Contemporary ComputerWear
1320-36th Ave San Francisco CA 94122

CIRCLE 836 ON READER SERVICE CARD

BAR CODING

BAR CODE READERS
AMERICAN MICROSYSTEMS
2190 A Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015
FOR PC, XT, AT, PS/2 & TERMINALS:

- No software changes required
- Data appears as keyboard input
- Reads Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Auto-discriminates between codes
- Accepts WAND, SLOT, CCD, LASER, MAG STRIPE

BAR CODE PRINTING SOFTWARE:

- For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers.
- Prints Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Easy to use

(800) 648-4452 • FAX: (817) 686-6232
30 Day Money Back Guarantee
One Year Warranty

CIRCLE 833 ON READER SERVICE CARD

TKS Builds a Better Bar Code Reader!

• Excellent first read rate
• Works with any program no software required
• Plastic wand is rugged, lightweight and comfortable, even after hours of use (stainless steel wand also available)
• Durable extruded aluminum case
• Reads all major bar code types
• 30-day money-back guarantee

EZBarcode PC-WEDGE II

- Free bar code printing utility included
- Complete with wand, it's

only \$289!

RS-212 version \$319
Macintosh version \$300
Stainless steel wand add \$60
Mag stripe option add \$100

Portable Hand held Data Collection Terminals
Easy-to-use application generated software included free

- PHT-34: Alphanumeric keypad, bar code wand, 128K memory .. \$1095
- PHT-60: Graphics touch-sensor LCD display, programmable function keys, bar code wand, RAM card port, 256K memory .. \$1795

Bar Code Printing Programs ... \$149 each
Print Code 39, UPC, EAN, 2 of 5 on dot matrix or Laser Jet printers
EZBarcode II - Keyboard or text file input, incrementing, on-line help
• dBARCODE - Prints bar codes from within dBASE
• EZRes - Memory resident bar code printing program

TimeKeeping Systems, Inc.
1306-C East 55th Street • Cleveland, Ohio 44103 • Phone: (216) 361-9995 • Fax: (216) 361-0030

BAR CODING

BAR CODE HEADQUARTERS

LABELING SOFTWARE



- For Epson, Oki, IBM, Dot Matrix and HP LaserJet Printers.
 - Any Format. Any size. Totally flexible design. Many formats furnished.
 - One Screen Label Design, WYSIWYG or text. Context sensitive help.
 - 16 text sizes — from .1" to 3" (readable from 100').
 - 13 Bar codes: 2of5, 128, UPC/EAN, MIL-STD, AIAG, ZIP, & Code 39.
 - Auto-incrementing. Simple operator interface. File input.
 - Reversals, color, soft fonts. Prints PCX files for logos, symbols, etc.
 - Powerful, Versatile, Easy, Fast! (drives LaserJet at 8ppm).
 - Label shown printed with LabelRIGHT™ — \$279
- (Other DOS bar code programs from \$49. XENIX — \$199).
(MS-DOS 'callable routines' from \$179. Mac bar code fonts \$99).

PORTABLE READERS

- Battery operated reader. Wand or laser input.
- Simple, powerful, 64K memory. Built in real-time clock.
- Bar code or keyed input. Easy raised rubber keyboard.
- Reads Codabar, MSI, 2of5, UPC/EAN, 128, Code 39.
- Easily programmable prompts. Uploads via RS-232 or keyboard.
- Doubles as non-portable reader (on-line wedge operation).
- Complete with stainless steel wand — \$849

FLEXIBLE MAGAZINE
Outstanding Price And Performance



BAR CODE READERS

- For PC, XT, AT, PS/2, Mac and all RS-232 Terminals
- Attaches as 2nd keyboard. No software changes needed.
- Reads 2of5, Codabar, UPC/EAN, 128, MSI, Code 39.
- 1 or 2 input scanners: wand, slot badge, magstripe, or laser.
- Top rated by independent review!
- Complete with steel wand — \$399.

Direct from manufacturer
30 day \$ back guarantee!
Company P.O.'s accepted
2 year warranty on wand & reader



WORTHINGTON

DATA SOLUTIONS
417 Ingalls Street • Santa Cruz, CA 95060

408-458-9938

800-345-4220

PC WAND BAR CODE READERS

\$279

NEW
IMPROVED



Starting at \$279 with wand! • Transparent operation. • No software required • PC, XT, AT, Mac, PS2, others. Look into our full line of reliable, competitively priced readers, keyboard and serial wedges, portable data collectors, multi-drop readers, wands, laser scanners, mag stripe readers, and bar code printing software • OEM and reseller discounts. We provide solutions to systems! Custom application software for Data Collections available. Call for details.

**INTERNATIONAL
TECHNOLOGIES
& SYSTEMS CORP.**

655-K North Berry St., Brea, CA 92621
(714) 960-1880 • FAX (714) 960-2503
13 Welwyn Ct., Richmond, VA 23229
(804) 741-6725

CIRCLE 839 ON READER SERVICE CARD

**ISD
SOFTWARE** Bar code software solutions for identifying products, labeling packages, tracking inventory, managing assets and paperwork, and more. Call for your free software solutions information packet.



Integrated Software Design, Inc.
171 Forbes Blvd.,
Mansfield, MA 02048.
(508) 339-4928.
FAX (508) 339-2257.

© 1990 Integrated Software Design, Inc.

CIRCLE 840 ON READER SERVICE CARD

LABEL MASTER

- Print quality bar codes with Label Master
- WYSIWYG layout • Money back guarantee
 - Supports matrix laser, thermal printers
 - Supports most bar codes • Supports graphics images
 - Label Master-479 • Quick Draw \$259
 - Developers Library with source-\$389

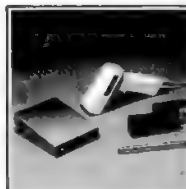
NEW



The **Computer Connection**
P.O. Box 634
Eau Claire WI 54702
(715) 833-2331

(800) 552-2331

CIRCLE 838 ON READER SERVICE CARD



BAR CODE & MAGNETIC STRIPE READERS For PC/XT/AT, PS/2, and RS-232 Interface

- Direct keyboard interface, no software change
- Reads UPC, EAN, Code 39, 11, 128, 125, Codabar, MSI
- Direct from manufacturer: 30 day money back guarantee
- Reader with steel wand — \$379
- with Magnetic Stripe Scanner — \$299
- Reseller discount available

SCANTECH

12981 Ramona Blvd. Unit 1
Irvine, CA 92714-3797

Tel: (618) 960-2099
Fax: (618) 962-4819

CIRCLE 841 ON READER SERVICE CARD

BAR CODING

continues on the next page.

■ BAR CODING

YOU WILL SAVE TIME AND ELIMINATE ERRORS WITH YOUR APPLE®, DEC™, IBM®, OR WYSE® COMPUTER AND PERCON® BAR CODE READERS.



You've never entered data so quickly or so accurately as you will using bar codes or magnetic stripes, and a PERCON Series 10 decoder. Our proven, reliable decoders "Auto-Learn" up to 13 key bar codes, require no software changes, and leave your keyboard free to use at all times. Simple keyboard, bus, or serial port plug-ins for a range of computers and terminals. 5 year warranty on decoders, 1 year warranty on input devices.

Call 1-800-8-PERCON.

PERCON
INCORPORATED

1710 Willow Creek Circle, Eugene, OR 97402 (503) 344-1189 FAX (503) 344-1399

AppleLink: D3857 CONNECT: PERCONENG 1

PERCON, Apple, DEC, IBM, and Wyse are trademarks of their respective companies

CIRCLE 842 ON READER SERVICE CARD

■ BOOKS/CATALOGUES/PUBLICATIONS

PCjr Owners!!

Everything You'll Ever Need Plus Much, Much More!!

- Memory Sidecars - Expand now to 1.2 MB!
- Second & Third Disk Drives which Snap-on-Top
- 3 1/2" 720K Disk Drives for PS/2 Compatibility
- Speed-Up Boards-Increase Speed to 9.54 MHz
- 20, 30, 40, 60 & 80MB Hard Disk Drive Systems
- 101-Key Enhanced PCjr Keyboards
- Serial Port Compatibility Boards
- Modifications for Tandy Compatibility
- PCjr Compatible Software & Game Cartridges
- PCjr System Units with 128K or 256K
- Diagnostic Service Only \$25
- Replacement Parts and Repair Service

Remember—When you purchase all your PCjr products from PC Enterprises you'll never need to worry about compatibility. Our new full color catalog now features over 300 PCjr products on 86 pages. Call or write for your FREE copy today!

(800) 922-PCjr (201) 280-0025

PC ENTERPRISES

"The jr Products Group"
PO Box 292 Belmar, NJ 07719

"Dedicated to the Support of the PCjr Since 1984"

CIRCLE 843 ON READER SERVICE CARD

IBM PCjr SPECIALS

Full line of IBM PCjr Hardware

- Memory Expansions to 640K
- Second Floppy Drives
- Parallel Printer Ports
- Full Size Keyboards
- Modems, Int. & External
- Joysticks, Serial Cables
- PCjr Network cards
- BASIC Cartridges, Mice
- PCjr Tested Shareware
- Complete Computers
- Repair Service

Send for Catalog Today

COMPUTER RESET

Attn: Dept. PCM

P.O. Box 461782, Garland Texas 75046
(214) 276-8072 FAX (214) 272-7920

CIRCLE 844 ON READER SERVICE CARD

■ DATA CONVERSION

CONVERTING YOUR DISKETTES?

ENTRUST THEM TO US

2500 Word Processor & Computer formats 3 1/2", 5 1/4", 8" DISKS, MAGNETIC TAPES, MAGNETIC CARDS, CARTRIDGES, & CASSETTES

DISK DUPLICATION OCR SCANNING SERVICES

Customized conversions too!
Call us for quality, best prices and quickest turnaround time

COMPANY COMPENDIA, INC.

TEL: 312-419-8771 (Chicago)

FAX: 312-419-1390

CIRCLE 845 ON READER SERVICE CARD

TOTAL SERVICE CONVERSIONS

- OUR NAME SAYS IT ALL •
 - Quality Service •
 - Quick Turnaround •
 - Low Prices •
 - 1-800-5-CONVRT (526-6878) •
 - In CA 1-213-669-8134 •
 - Word Perfect Training Available •
- TOTAL SERVICE CONVERSIONS, INC.**
1933 North Monon Street
Los Angeles, CA 90027

QUALITY CONVERSIONS

TAPE ↔ DISK ↔ SCANNING

QUICK TURNAROUND

Word Processor: Micro, Mini, Main Frame, Teletype
(Customized Programming Available)

IBM	APPLE	LANIER	MS/DOS
MAC	CPT	MICOM	SPREADSHEETS
WANG	NBI	UNIX	DATABASES
XEROX	EXXON	XENIX	MAILISTS
DEC	VYDEC	CP/M	2000 OTHERS

Optical Storage/Retrieval
Paper, Film, Fiche

1-KUN Computer Services Inc.
1261 Broadway, Suite 508 New York, N.Y. 10001

**FREE (212) 779-0800 BEST
TEST (800) 833-2207 RATES**

CIRCLE 847 ON READER SERVICE CARD

CHANGING WORD PROCESSORS?

Media transfer to or from
IBM, XEROX, DEC, WANG, EXXON, MACS,
LANIER, CPT, CT, MICOM, NBI, WRDPLX,
WORDSTAR, WORDPERFECT, MS/WRD, DWA,
MULTIMATE, SAMNA, MASII, DCA.
*****FREE TEST CONVERSION*****
Conversion Specialists
531 Main St., Suite 835
El Segundo, CA 92045
(213) 545-6551
(800) 825-0540

■ DATA RECOVERY SERVICES

ONTRACK DATA RECOVERY

The Data Recovery Professionals

Ontrack Data Recovery specializes in recapturing data from any microcomputer hard drive or floppy diskette.

- Recommended by major hard drive manufacturers
- The most technologically advanced recovery service
- Proven results

Find out why we are the leaders in data recovery - call an Ontrack Data Recovery representative today for more information.

1-800-872-2599

MN: 612-937-5161 FAX: 612-937-5750

CIRCLE 846 ON READER SERVICE CARD

Did you know...

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts. Call your PC Magazine Marketplace Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

Source: Beta Research Study, 1988
*BPA Audit June, 1990

To place your ad in **PC MAGAZINE Marketplace**

Call (212) 503-5115 or (800) 825-4ADS

■ DISK CONVERSION

TAPE/DISK CONVERSIONS

Conversion services to or from over 2000 computer systems:
• Magtapes • Mini Computers
• Micro Computers • Typesetters
• Word Processors

CALL THE INDUSTRY LEADERS

**PIVAR
COMPUTING SERVICES, Inc.**

800 - CONVERT

708-459-6010

165 Arlington Heights Rd #M
Buffalo Grove, IL 60089

■ DISKETTE COPY SERVICES



**For Expert 24 Hour
Software Duplication
Call 800-533-4188**

- ◆ 100% Satisfaction Guaranteed
- ◆ Superb 7 Step QC Process with Digital Diskette Analysis
- ◆ Turnkey Printing, Packaging & Assembly Service Provided

DATA SERVICES, INC.
In PA 215-363-2400

CIRCLE 850 ON READER SERVICE CARD

■ INSURANCE



SAFEWARE

**INSURES YOUR
COMPUTERS**

Full replacement of hardware, media, purchased software. As low as \$49 yearly. Covers fire, theft, power surges, other accidents. Blanket coverage; no list of equipment needed. Call for information or immediate coverage.

1-800-848-3469
Local (614) 262-0559

SAFEWARE, The Insurance Agency Inc
2929 N. High Street, P.O. Box 02211
Columbus OH 43202

CIRCLE 853 ON READER SERVICE CARD

TAPE-TO-FLOPPY
FLOPPY-TO-TAPE
TAPE DUPLICATION
FLOPPY-TO-MICROFICHE
LASER PRINTING

1-800-422-9622
(In NJ: 918-254-9622)

**TS TECHNICAL PROGRAMMING
SERVICES, INC.**
8506 EAST 61ST STREET
TULSA, OK 74133 1301

CIRCLE 848 ON READER SERVICE CARD

**Software
Production**

- Disk Duplication
- LOCK/PRO copy protection
- Label/sleeve printing
- All formats • Warehousing
- Full packaging services
- Fulfillment • Drop shipping
- 48-hour delivery
- Consultation & guidance

Star-Byte, Inc.
2880 Bergey Rd Hatfield PA 19440

800-243-1515

CIRCLE 851 ON READER SERVICE CARD

■ SUPPLIES

TONER CARTRIDGES TESTED • GUARANTEED • 24-HR TURN.

RECONDITIONED HP, Apple, Canon, QMS, etc.
Canon Microfiche & Copiers **\$45**
We buy empties! SHIP INCL.
SHARP Z-Series & Canon PC Copiers \$40

NEW TONER CARTRIDGE SPECIAL!
Canon Brand Series II/III toners, min.
of four, C.O.D., VISA/MC/AMEX only **\$79⁹⁵**
Ship. extra, C.O.D. (\$3.30), 2% surcharge
on VISA/MC, 4% surcharge on AMEX.

1-800-239-4027 **ADVANTAGE
LASER PRODUCTS**
2216 University Blvd
CIRCLE 854 ON READER SERVICE CARD Tuscaloosa, AL 35401

■ DISKETTE COPY SERVICES

**SOFTWARE
DUPLICATION**

- One-Stop Shopping
- Custom Packaging
- Copy Protection
- Technical Support
- Drop Shipping
- Fast Turn-Around
- Competitive Pricing

800-222-0490
In NJ 201-462-7628
FAX 201-462-5658

MEGA Soft
P.O. Box 710, Freehold NJ 07728
Full Service Duplication Facility

CIRCLE 849 ON READER SERVICE CARD

**DUPLICATION FROM \$59
HIGHEST QUALITY MEDIA**

MSDOS duplication from \$59 (\$5.25')
and \$99 (\$3.5'). Prices go even lower
as you continue to order!

- Duplication + 100% Verification
- Custom Labels/Sleeves/Mailers
- Custom Packaging & Assembly
- Colored Media Available
- Special Rates For Demo Software & Site Licensing
- Educational Discounts Available
- 24 Hour Turn-Around
- Guaranteed Products

800-255-3142
Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 852 ON READER SERVICE CARD

COPY YOUR FLOPPY

DiskDupe 3.1 saves you money and gets your disks out the door fast by copying up to 200 an hour on your existing PC. DiskDupe fully verifies each copy and rejects any that aren't perfect. DiskDupe even verifies your disks that were sent out for duplication. Order today! Only \$79 + s/h. Money Back Guarantee.

MICRO SYSTEM DESIGNS
4962 El Camino, Suite 204
Los Altos, CA 94022
(415) 964-2844, Fax: (415) 964-4529

24 HOUR TURNAROUND

**QUALITY TONER CARTRIDGE
REMANUFACTURING**

20% More Toner • Darker Print • 100% Guaranteed
Replacement drums now available • We Buy Empties

Laser Research, Inc.
9741 M Southern Pine Blvd
Charlotte, N.C. 28273 **1-800-462-7143**

\$39.95

SHIPPING INCLUDED

CIRCLE 855 ON READER SERVICE CARD

Color Laser print on plain paper - transfer to transparencies, slides, photo, circuit boards, more! **FREE Samples**

Black Lightning **Toner**

Black Long Life Text Color & Graphics
800-BLACK99
1-800-252-2599 Fax (802) 436-3258

New & Remanufactured
HP LaserJets, Ricoh Apple LaserWriters
Canon PC Copiers
Kyocera & more!
We buy used cartridges

CIRCLE 856 ON READER SERVICE CARD

TONER **2 DAY AIR
Return Delivery**

Lasertone LaserQuip brand cartridge for HP, etc.
24 hour turnaround
100% Satisfaction
Toner for NEC, Ricoh, Panasonic, Qume, etc.
Color...\$61.50
Black...\$41.50
Color...\$81.50
Black...\$51.50

800-777-8444

*Franchises
*Wholesale

CIRCLE 857 ON READER SERVICE CARD

Calling about an ad? Say you saw it in
PC Magazine Marketplace

READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE
AFTER HOURS				440	Media-Link/PM	RGB Corp.	55	603	Prompt	Access Softek	149
426	TurboTax	ChipSoft Inc.	462	439	Bridge Batch	Softbridge Inc.	55	605	Distinct Back-Up	Distinct Corp.	157
424	Sylvia Porter's RapidTax	DACEasy Inc.	460	437	The Norton AntiVirus	Synantec Corp.	55	608	WinNav	FlashPoint Development	158
423	Andrew Tobias' TaxCut	Meca Software Inc.	459	430	Clip-Art Window Shopper 1.1	The Adonis Corp.	50	606	File Shuttle XPress, Release 5.0	GetC Software Inc.	157
425	Swiftax	Timeworks Inc.	461	444	CommonKnowledge	Wang Laboratories Inc.	55	607	Zip Manager	Moon Valley Software Inc.	157
COMMUNICATIONS				433	AutoWord, Version 1.06	White Crane Systems Inc.	49	604	Pubtech File Organizer	Publishing Technologies Inc.	152
414	FaxConnecton 5011A	Extended Systems Inc.	315	WINDOWS (CONNECTIVITY)				ACCESSORIES			
415	JetFax	JetFax Inc.	316	418	Extra! for Windows, Version 3.0	Attachmate Corp.	246	612	WinSleuth	Dariana Technology Group	166
417	Tefax System Model RA2110	Relisys	322	420	LinkUp 3270 COAX Windows UniSession, Version 5.01	Chi Corp.	254	615	K-Free	Dragon's Eye Software	166
416	Fax-O-Matic	Tall Tree Systems	319	419	IRMA WorkStation for Windows, Version 1.0	Digital Communications Associates Inc.	247	611	FirstApps	hDC Computer Corp.	164
COMPUTERS				421	Netlogic W3270 Support Package, Version 2.1	Netlogic Inc.	260	609	Almanac	Impact Software	158
436	Premium Exec 386SX/ 20 Model 23V	AST Research Inc.	55	422	Rumba, Version 3.0 (HARDWARE)	Wall Data Inc.	272	614	METZ Dialer	METZ Software	166
701	Cumulus GLC-SBS	Cumulus Computer Co.	48	427	Renaissance Rendition II	Appian Technology Inc.	207	613	METZ Phones	METZ Software	166
405	IBM PS/2 Model 90 XP 486	IBM Corp.	287	428	VGA Basic-16	ATI Technologies Inc.	207	610	DeskTop Set	Okna Corp.	158
406	IBM PS/2 Model 95 XP 486	IBM Corp.	287	428	VGA Wonder Plus	ATI Technologies Inc.	207	SCREEN AND MOUSE ENHANCERS			
HARDWARE				429	NEC MultiSync Graphics Engine	NEC Technologies Inc.	207	620	Magic	Dynamic Information Systems	170
441	A1-4000	Always Technology Corp.	55	542	VEGA VGA	Video Seven/Headland Technology Inc.	207	616	WideAngle	Inner Media Inc.	168
438	SuperVGA by Boca board	Boca Research Inc.	55	542	VGA 1024i	Video Seven/Headland Technology Inc.	207	619	METZ Lock	METZ Software	170
435	MSound Stereo	MSound International LP	55	542	V-RAM VGA	Video Seven/Headland Technology Inc.	207	618	Microsoft Entertainment Pack for Windows	Microsoft Corp.	170
431	The Video Toaster, Version 1.0	NewTek Inc.	36	543	Paradise Basic VGA Card	Western Digital Imaging	207	621	Whiskers	Numbers & Co.	176
443	ProScan PS-3000	OBM Corp.	55	543	Paradise VGA 1024 Card	Western Digital Imaging	207	KEYBOARD & MACRO UTILITIES			
PRINTERS				(UTILITIES)				624	Tempo For Windows	Affinity Microsystems Ltd.	180
446	Canon BJ-330	Canon USA Inc.	43	DESKTOP MANAGEMENT				625	Recorder Run	e-Image	187
700	Kodak Diconix Color 4 Printer	Eastman Kodak Inc.	44	550	StraightLine	First Genesis Software Inc.	145	623	Pubtech BatchWorks	Publishing Technologies Inc.	180
READ ONLY				549	Windows Express	hDC Computer Corp.	140	622	Bridge Tool Kit	Softbridge Inc.	178
396	Envisioning Information	Graphics Press	65	546	METZ Desktop Manager	METZ Software	138	626	Hotkeys	Software GT	187
397	Looking Good in Print, Second Edition	Ventana Press	65	601	METZ Runner	METZ Software	145	TEXT EDITORS AND VIEWERS			
SOFTWARE				547	METZ Task Manager	METZ Software	139	628	SpeedEdit	Bradford Business Systems Inc.	187
445	The 3D Studio	Autodesk Inc.	33	544	Aporia	NewTools Inc.	137	629	CView	Eastern Language Systems	191
449	ObjectVision for Windows	Borland International	33	548	SmartWin	Romberg & Romberg	140	627	Pubtech Text Editor	Publishing Technologies Inc.	187
409	Financial Wonder, Version 1.6	BrainChild Software Inc.	335	545	Command Post	Wilson WindowWare	133	ICON EDITORS			
450	Forest and Trees for Windows	Channel Computing Inc.	38	FILE MANAGERS				630	IconDraw	Philip B. Eskelin, Jr.	191
448	ReadyLINK	Complex Inc.	46	602	Becker Tools	Abacus	148	631	PBIcon	Impact Software	192
706	HyperACCESS/5, Version 2.0	Contact Hilgraeve	60	603	Dragnet	Access Softek	149	632	Transparent Icon Editor	Jason Lacombe	192
704	XTree Gold, Version 2.0	Contact XTree Co.	60	PRODUCTIVITY				NETWORK UTILITIES			
407	Business Wits, Version 1.0	Decisus Inc.	330	DEPARTMENT				633	Windows Workstation	Automated Design Systems Inc.	197
432	WinFax	Delrina Technology Inc.	49	PROGRAM NAME / DESCRIPTION				634	NetMagic	R.D. Software Inc.	199
408	Encore Plus, Version 1.5	Ferox Microsystems Inc.	332	Lab Notes	What you should know about the FCC emission standards.						351
705	Invisible Network, Version 2.0	Invisible Software	60	Utilities	MBOOT.COM: A multiple boot program for your PC.						359
442	Ascend	LeTECH International Inc.	55	Environments	An introduction to the Windows 3.0 Palette Manager.						375
703	Lotus Add-In Tool Kit for 1-2-3, Release 3.1	Lotus Development Corp.	60	Power Programming	DOS extenders old and new: Protected-mode programming in DOS.						385
447	CalANDar 1.25	Microsystems Software Inc.	50	Windows	It's best to use the keyboard when recording macros.						395
410	The Mobley Matrix, Version 2.1	Mobley Matrix International Inc.	345	Windows	Assigning an icon to SYSEDIT.EXE.						395
702	GRasp, Version 4.0	Paul Mace Software Inc.	60	Windows	How to customize your DOS shell so TSRs won't steal memory from Windows sessions.						395
				Databases	Some fast, flexible techniques for padding numeric strings.						399
				Databases	How to incorporate custom color selection into your Clipper applications.						399
				Spreadsheets	An alternative to 1-2-3's @D360 function.						403
				Spreadsheets	Transform Excel's bar charts into flexible project management tools.						403
				The Working Word	Add ASCII characters to documents with four simple keystrokes.						407
				The Working Word	How to merge all your graphics into one WordPerfect file.						407
				The Working Word	Increase the power of a Word macro by linking it to a batch file.						407
				User-to-User	FIND the /C switch and make it possible to analyze and act on DOS output.						409
				User-to-User	Batch files that make it easy to rotate several sets of backups.						409
				Tutor	How to trick DOS so that your floppy drive will recognize disk changes.						411
				Tutor	An updated version of WHATCPU.COM.						411

ADVERTISERS PRODUCT INDEX

RS#	ADVERTISER	PRODUCT	PAGE#
ACCOUNTING SOFTWARE			
348	Chipsoft	TURBO TAX	468-469
502	Dac Easy, Inc.	ACCOUNTING SOFTWARE	126-127
136	M-USA Business Systems, Inc.	ACCOUNTING SOFTWARE	76
263	Macola Inc.	ACCOUNTING SOFTWARE	324-325
DATABASE MANAGERS			
285	Borland International	PARADOX	59
178	Claron Software	PROFESSIONAL DEVELOPER	381
315	Concentric Data Systems	H&R RELATIONAL REPORT WRITER	193
*	Oracle	DATABASE	94
199	X-Tree Div of Executive Systems	XTREE PRO GOLD	166-167
INFORMATION MANAGERS			
315	Concentric Data Systems	R&R RELATIONAL REPORT WRITER	193
291	Map Info	MAP INFO	199
INTEGRATED SOFTWARE			
366	Enable Software Inc.	INTEGRATED SOFTWARE	206
344	Symantec	O&A	26
LANGUAGES			
*	Mark Williams	COHERENT UNIX OPERATING SYSTEM	257
*	Pacific Data Products	COMPLETE FONT	317
OPERATING SYSTEMS/ENVIRONMENTS			
*	Mark Williams	COHERENT UNIX OPERATING SYSTEM	257
*	Microsoft	WINDOWS 3.0	310-311
*	Microsoft	WINDOWS LINE	18-19
*	Microsoft	WORD FOR WINDOWS	CONV2-4, PG1
393	Software Link, Inc.	PC-MOS	80
PROGRAM DEVELOPERS/GENERATORS			
178	Claron Software	PROFESSIONAL DEVELOPER	381
PROJECT MANAGEMENT			
148	Primavera Systems	PROJECT MANAGEMENT SOFTWARE	68
264	Symantec	TIME LINE	396
STATISTICAL SOFTWARE			
103	SPSS, Inc.	STATISTICAL SOFTWARE	326
UTILITIES			
328	Buffalo Products	PRINTING & FILE UTILITY TRANSFER	384
315	Concentric Data Systems	R&R RELATIONAL REPORT WRITER	193
288	Fifth Generation	DIRECT ACCESS	165
286	Fifth Generation	MACE UTILITIES	255
*	Fifth Generation	FASTBACK PLUS	307
236	Fifth Generation	FASTBACK PLUS	309
313	Helix Software	NETROOM	51
*	Pacific Data Products	COMPLETE FONT	317
290	Rose Electronics	E-MAIL, FILE TRANSFER, PRINTER	346
184	Symantec	PETER MORTON - ANTI-VIRUS	210-211
209	Symantec	PETER MORTON - UTILITIES	160-161
199	Xtree-Div of Executive Systems	XTREE PRO GOLD	166-167
WORD PROCESSING SOFTWARE/AIDS			
315	Concentric Data Systems	R&R RELATIONAL REPORT WRITER	193
143	Lotus - Word Processing Div.	WORD PROCESSOR	131-134
275	NBI, Inc.	LEGACY	168-169
*	Pacific Data Products, Inc.	COMPLETE FONT	317
290	Rose Electronics	Master Switch/MasterNet	346
255	Wordstar International	OFFICE 3.0	64
		WORDSTAR 6.0	379
SPREADSHEET/TEMPLATES			
287	Borland International	QUATTRO PRO	57
*	Lotus Development Corporation	LOTUS 1-2-3 3.1	104
FOREIGN LANGUAGE SOFTWARE			
511	Microtac Software	SPANISH ASSISTANT	373
DESK TOP PUBLISHING			
*	Pacific Data Products, Inc.	COMPLETE FONT	317
299	SWFTE International	GLYPHIX	37
TAX SOFTWARE			
348	Chipsoft	TURBO TAX	468-469
502	DAC Easy, Inc.	TAX SOFTWARE	126-127
382	Meca	TAX CUT & MANAGING YOUR MONEY	465
539	Softview, Inc.	WINDOWS-BASED TAX SOFTWARE	462
VERTICAL MARKET SOFTWARE			
731	Stac Electronics	STACKER	217
EDUCATIONAL SOFTWARE			
186	PC Globe	PC GLOBE SOFTWARE	88
ENTERTAINMENT SOFTWARE			
*	Microsoft	ENTERTAINMENT PACK	463
188	PC Globe	PC GLOBE SOFTWARE	88
HOME MANAGEMENT SOFTWARE			
376	Meca	HOME LAWYER	216
FORM DESIGNERS			
250	Delma Technology	PERFORM 2.1	213
*	Ventura Software Inc.	FORM BASE	151
FONT SOFTWARE			
*	Pacific Data Products, Inc.	COMPLETE FONT	317
MAILING SOFTWARE			
339	Group 1 Software	ARCLIST	28
339	Group 1 Software	ARCMAIL	28
MAPPING SOFTWARE			
291	Map Info	MAP INFO	199
FLOWCHARTING			
124	Roykore, Inc.	ABC FLOWCHARTER	232

RS#	ADVERTISER	PRODUCT	PAGE#
WINDOWS SOFTWARE			
*	Attachmate	EXTRA! FOR WINDOWS	265
389	DCA	IRMA WORKSTATION FOR WINDOWS	262-263
143	Lotus - Word Processing Div.	WORD PROCESSOR	131-134
291	Map Info	MAP INFO	199
*	Microsoft	WINDOWS 3.0	310-311
*	Microsoft	WINDOWS LINE	18-19
275	NBI, Inc.	LEGACY	168-169
124	Roykore, Inc.	ABC FLOWCHARTER	232
539	Softview, Inc.	WINDOWS-BASED TAX SOFTWARE	462
DATA COMPRESSION SOFTWARE			
724	Softlogic Solutions	DISK OPTIMIZER	391
731	Stac Electronics	STACKER	217
COMPATIBLE KEYBOARDS			
190	Key Tronic	KEYBOARDS	350
*	Northgate Computer Systems	KEYBOARDS	238
BACKUP SOFTWARE			
*	Fifth Generation	FASTBACK PLUS	307
236	Fifth Generation	FASTBACK PLUS	309
DISK BACKUP & TAPE DRIVES			
107	Everex	FLOPPY TAPE BACKUP	312
378	Imega Corporation	BERNOULLI BOX	230-231
495	Maynard Electronics	DATA BACKUP	394
390	Micro Solutions	DISK BACKUP & TAPE DRIVE	397
*	Seagate Technology	DRIVES	159
HARD DISKS			
147	Plus Development	HARD CARD II XL	125
731	Stac Electronics	STACKER	217
COMPUTERS/COMPATIBLES			
519	Acer America Corporation	SX	297
130	Acma Computers, Inc.	ACMA PC'S	320-321
165	Advanced Logic Research	BUSINESS VEISA 486/25 & 386/33	33
509	Austin Computers	PC'S	9-13
478	Automated Computer Tech, Corp.	PC'S	42
516	CMO	MAIL ORDER	258-259
109	Comp. Discount Warehouse (MMC)	COMPATIBLES	423
132	Comp. U.S.A.	Hardware Software Peripherals	52-53
COMPUTERS/COMPATIBLES			
*	Compu Add	325 DX KIT	220-221
*	Compu Add	386 SX	222-223
*	Compu Add	COMPU ADD PORTABLES	361-364
*	Compu Add	333T	153-156
*	Compu Add	PC'S	424-425
*	Compu Add	PC'S	177
*	Compu Add	PC'S	179
*	Compu Add	PC'S	181
470	Dell Computer Corporation	DELL PC'S	72-73
532	Dell Computer Corporation	DELL PC'S	348-349
*	Dell Computer Corporation	DELL PC'S	471-472
536	Dell Computer Corporation	DELL PC'S	CONV5-CONV6
*	EPS Technologies	COMPATIBLES	84-85
479	Ergo Computing Inc.	PC'S	182-183
113	Everex	TEMPO NOTEBOOK 286, 386	382-383
*	Gateway 20000	COMPATIBLES	48A-H
*	Hewlett Packard-Vectra	H-P VECTRA PC'S	162
480	Inversion Computer Corporation	COMPUTERS & COMPATIBLES	61-63
190	Key Tronic	KEYBOARDS	350
*	Microtab	COMPATIBLES	22-23
*	Microway	CO-PROCESSORS	45
157	NEC Technologies Inc.	POWERMATE 386/255	190
*	Northgate Computer Systems	COMPATIBLES	234-239
145	Paradise Computer Products Ltd	PC'S	427
303	PC Brand	PC'S	275-286
368	PC Brand	PC'S	430-431
523	PC Brand	PC'S	214-215
*	Quill Corp	COMPATIBLES	233
316	Samsung Information Systems	NOTEBOOK PC	128
163	Standard Computer (CPU)	PC'S	98-101
312	Tandon Computer Corporation	COMPATIBLES	200-201
744	Tandon Computer Corporation	COMPATIBLES	202-203
333	Tandon Computer Corporation	COMPATIBLES	204-205
391	Tangent Computer, Inc.	PC'S	111
206	Telemart	PC'S	90-93
306	Tenex Computer Express	MAIL ORDER	429
121	Tri-Star Computer	COMPUTERS/COMPATIBLES	17
177	Ultra Comp	COMPATIBLES	40-41
112	Wyse Technology	PC'S	47
211	Xurcom	ETHERNET ADAPTER CARD	77
732	Zenith Data Systems	COMPATIBLES	86
721	Zeos International	COMPATIBLES	78-79
388	Zeos International	COMPATIBLES	268-269
487	Zeos International	COMPATIBLES	392-393
493	Zeos International	COMPATIBLES	30-31
*	Zeos International	COMPATIBLES	337-344
115	Zeos International	ZEOS NOTEBOOK	113-120
723	Zeos International	Z-CARD	121
		COMPATIBLES	29
INPUT DEVICES			
123	FTG Data Systems	FT 1000 PRECISION LIGHT PEN	397
220	Kensington Microware Ltd.	EXPERT MOUSE	291
142	Mouse Systems	THE PCMOUSE III	227
120	Mouse Systems	PageBrush Color	229
268	Swan Technologies	MAIL ORDER	141-144
PROGRAMMERS TOOLS UTILITIES			
*	Mark Williams	COHERENT UNIX OPERATING SYSTEM	257
MULTIFUNCTION BOARDS			
123	FTG Data Systems	FT 1000 PRECISION LIGHT PEN	397
ADD-ON BOARDS			
128	Capital Equipment Corporation	ADD IN BOARDS	373

RS#	ADVERTISER	PRODUCT	PAGE#
276	FTG Data Systems	FT 1000 PRECISION LIGHT PEN	397
346	Hauptpage Computer Works, Inc.	486 MOTHERBOARDS	32
	Specialty Software	DISK CACHING CONTROLLER CARD	299
SCANNERS/DIGITIZERS			
329	Nikon, Inc.	ELECTRONIC IMAGING LB3500	196
PRINTERS			
328	Buffalo Products	PRINTER SHARING DEVICE	379
187	Canon, USA	LASER BEAM PRINTERS	403
362	Eastman Kodak (Copy Products)	EXTAPLUS 7016	194-195
	Epson	LASER PRINTER	368-369
	Hewlett Packard-Peripheral Group	H-P SCAN JET PLUS	188-189
394	NEC Technologies Inc.	PINWRITER 9300	82
235	Olivetti	PRINTERS	294-295
	Pacific Data Products	COMPLETE FONT	317
250	QMS	LASER PRINTER	5
290	Rose Electronics	PRINTER SHARING SWITCHES	346
750	Texas Instruments	MICROLASER XL	292
HAND-HELD PC'S			
316	Samsung Information Systems	NOTEBOOK PC	128
193	Sharp Electronics Corp.	WIZARD	388-389
FONT CARTRIDGES			
325	IQ Engineering	FONTS	21
TRACK BALLS			
220	Kensington Microware Ltd.	EXPERT MOUSE	291
PRINTER ACCESSORIES			
727	ASP Computer Products	PRINTER SHARE	274
328	Buffalo Products	PRINTER SHARING DEVICE	379
	Pacific Data Products, Inc.	COMPLETE FONT	317
290	Rose Electronics	PRINTER SHARING DEVICE	346
PORTABLE/LAP COMPUTERS			
328	Buffalo Products	TOSHIBA MEMORY BOARDS	379
273	Bus Computer	LAPTOPS	420
532	Dell Computer Corporation	LAPTOPS	348-349
479	Ergo Computing Inc.	PORTABLES	182-183
113	Everex	TEMPO NOTEBOOK 286, 386	382-383
396	NEC Technologies Inc.	ULTRALITE 286V	347
316	Samsung Information Systems	NOTEBOOK PC	128
312	Tandon Computer Corporation	PORTABLES	200-201
744	Tandon Computer Corporation	PORTABLES	202-203
333	Tandon Computer Corporation	PORTABLES	204-205
169	Toshiba of America	LAPTOPS, PORTABLE PC'S	171
211	Xircom	ETHERNET ADAPTER CARD	77
732	Zenith Data Systems	LAPTOP	86
	Zeos International	ZEOS NOTEBOOK	113-120
PC-FAX			
374	Intel - PCEO	FAX BOARD	70-71
530	Jet Fax	FAX-PC	96
CO-PROCESSORS			
	Microway	CO-PROCESSORS	45
343	Performance Memory Products	CO-PROCESSOR	432
MEMORY SUBSYSTEMS			
	Hard Drives Int'l (Insight Dis)	MEMORY	434
378	Imomega Corporation	BERNOULLI BOX	230-231
343	Performance Memory Products	MEMORY	432
160	Sigma Data	MEMORY UPGRADES	354
539	South Coast Electronics	MEMORY UPGRADES	429
306	Tenex Computer Express	MEMORY UPGRADES	429
CD-ROM			
180	Bureau of Electronic Publishing	CD-ROM	4
CHIPS/PROCESSORS			
197	Advanced Micro Devices	80287 CO-PROCESSOR	409
	Intel (PCEO)	CHIPS	331
512	Intel (PCEO)	CHIPS	333
	Microway	CO-PROCESSORS	45
DISPLAYS/MONITORS/TERMINALS			
	IBM Corp.	8515 DISPLAY	300
248	Mirror Technologies	MONITORS	186
153	NEC Technologies, Inc.	MULTISYNC MONITORS	24-25
296	SAMTRON	MONITORS	66
490	Seiko Instruments	MONITORS	39
GRAPHICS SOFTWARE			
	Ashton Tate	DRAW APPLAUSE II	185
522	Calera Recognition Systems	OCR SOFTWARE	318
729	Corel Systems	COREL DRAW	198
291	Map Info	MAP INFO	199
	Micrographix	DESIGNER	20
	Software Publishing	HARVARD GRAPHICS	358
PLOTTERS/CHARTING DEVICES			
	Pacific Data Products	COMPLETE FONT	317
VIDEO GRAPHICS/BOARDS			
540	ATI Technologies Inc.	8514 BOARD	226
171	GSS/Spectrographics	SQUEEGEE	4168
118	Hercules Computer Technology	HERCULES GRAPHIC STATION CARD	228
COMMUNICATIONS SOFTWARE			
328	Buffalo Products	PRINTING & FILE UTILITY TRANSFER	379
739	Compex, Inc.	READYLINK	97
504	Datascorm Technologies Inc.	PROCOMM PLUS 2.0	261
332	Dynamic Microprocessor Assoc.	pcANYWHERE IV	74
290	Rose Electronics	COMMUNICATIONS SOFTWARE	346
LOCAL AREA NETWORKING			
293	3 COM	NETBUILDER	356-357
254	Artisoft	LANTASTIC	372
328	Buffalo Products	PRINTER SHARING DEVICE	379
739	Compex, Inc.	READYLINK	97
536	Dell Computer Corporation	DELL PC'S	cov5-cov6
126	Future Soft Engineering	DYNACOMM ELITE	242
	Pacific Data Products, Inc.	COMPLETE FONT	317
290	Rose Electronics	PRINTER SHARING DEVICE	346
290	Rose Electronics	PERIPHERAL SHARING SWITCHES	346
230	US Sage	MAINLAN	245

RS#	ADVERTISER	PRODUCT	PAGE#
211	Xircom	ETHERNET ADAPTER CARD	77
MICRO-MAINFRAME LINKS			
389	DCA	IRMA WORKSTATION FOR WINDOWS	262-263
126	Future Soft Engineering	DYNACOMM ELITE	242
MODEMS			
374	Intel (PCEO)	MODEMS	70-71
367	Universal Data Systems	MODEMS	240
EMULATORS/PROTOCOL CONVERTERS			
	Pacific Data Products, Inc.	COMPLETE FONT	317
MULTIUSER SYSTEMS			
	Mark Williams	COHERENT UNIX OPERATING SYSTEM	257
290	Rose Electronics	MASTER SWITCH	346
230	US Sage	MAINLAN	245
SOFTWARE MEDIA SHARING			
234	3XUSA	3XLINK-16	401
PERIPHERAL SHARING DEVICE			
727	ASP Computer Products	PRINTER SHARE	274
328	Buffalo Products	PRINTER SHARING DEVICE	379
290	Rose Electronics	MASTER SWITCH	346
DISKETTES			
337	Sony Magnetic Products Co	FLOPPY DISK/DATA CARTRIDGE	367
PC ACCESSORIES			
731	Stac Electronics	STACKER	217
112	Wyse Technology	ACCESSORIES	47
MAIL ORDER			
130	Acma Computers, Inc.	ACMA PC'S	320-321
336	Arlington Computer Products	MAIL ORDER	433
509	Austin Computers	MAIL ORDER	9-13
481	Bull Dog Computer Products	MAIL ORDER PRODUCTS	428
516	CMO	MAIL ORDER	258-259
109	Comp. Discount Warehouse (MMC)	MAIL ORDER	423
132	Comp. U.S.A.	HARDWARE, SOFTWARE, PERIPHERALS	52-53
	Compu-Add	325 DX KIT	220-221
	Compu-Add	386 SX	222-223
	Compu-Add	COMPU ADD PORTABLES	361-364
	Compu-Add	333T	153-156
	Compu-Add	MAIL ORDER	424-425
206	Compuclassics	MAIL ORDER SOFTWARE	54
470	Dell Computer Corporation	DELL PC'S	72-73
532	Dell Computer Corporation	DELL PC'S	348-349
	Dell Computer Corporation	DELL PC'S	471-472
536	Dell Computer Corporation	DELL PC'S	C5-C8
347	Dustin Discount Software	MAIL ORDER SOFTWARE	14
	EPS Technologies	MAIL ORDER	84-85
479	Ergo Computing Inc.	MAIL ORDER	182-183
	EXCEL MICRO	MAIL ORDER	432
	FASTMICRO	MAIL ORDER	416C
352	FASTMICRO	MAIL ORDER	416D-417
282	First Source International	MAIL ORDER	429
	Gateway 2000	MAIL ORDER	48A-H
	Hard Drives Int'l (Insight Dis)	MAIL ORDER	418
	Hard Drives Int'l (Insight Dis)	MAIL ORDER	434
	Mark Williams	COHERENT UNIX OPERATING SYSTEM	257
307	Micro National	MAIL ORDER	435
225	Micro Warehouse	MAIL ORDER	172-175
	Microtab	MAIL ORDER	22-23
	Microway	CO-PROCESSORS	45
489	Midwest Computer Works	MAIL ORDER	426
	Northgate Computer Systems	MAIL ORDER	234-239
145	Paradise Computer Products Ltd	MAIL ORDER	427
523	PC Brand	MAIL ORDER	214-215
	PC Connection	MAIL ORDER	248-253
	PC Zones Int'l, Inc.	SOFTWARE/MAIL ORDER	303-304
343	Performance Memory Products	MAIL ORDER	432
	Quill Corp	MAIL ORDER	233
373	Software Add-Ons	MAIL ORDER	419
539	South Coast Electronics	MAIL ORDER	429
268	Swan Technologies	MAIL ORDER	141-144
206	Telemart	MAIL ORDER	90-93
306	Tenex Computer Express	MAIL ORDER	429
177	Ultra Comp	MAIL ORDER	40-41
721	Zeos International	COMPATIBLES	78-79
388	Zeos International	COMPATIBLES	268-269
487	Zeos International	COMPATIBLES	392-393
493	Zeos International	COMPATIBLES	30-31
	Zeos International	COMPATIBLES	337-344
115	Zeos International	ZEOS NOTEBOOK	113-120
723	Zeos International	Z-CARD	121
	Zeos International	COMPATIBLES	29
BOOKS			
172	Abacus	COMPUTER BOOKS	16
APPLE PRODUCTS			
251	Apple Computer	APPLE HARDWARE PRODUCTS	404-405
UNIX PRODUCTS			
	Mark Williams	COHERENT UNIX OPERATING SYSTEM	257
MISCELLANEOUS			
172	Abacus	COMPUTER BOOKS	16
	IBM Corp.	MALCOLM BALDRIDGE AWARD	89
DIRECT MARKETING CONNECTION			
336	Arlington Computer Products	MAIL ORDER	433
481	Bull Dog Computer Products	MAIL ORDER	428
273	Bus Computer	MAIL ORDER	420
109	Comp. Discount Warehouse (MMC)	MAIL ORDER	423
206	Compuclassics	MAIL ORDER	54
	EXCEL MICRO	MAIL ORDER	432
	FASTMICRO	MAIL ORDER	416D-417
282	First Source International	MAIL ORDER	429
171	GSS/Spectrographics	MAIL ORDER	4168
	Hard Drives Int'l (Insight Dis)	MAIL ORDER	434
307	Micro National	MAIL ORDER	435
489	Midwest Computer Works	MAIL ORDER	426
145	Paradise Computer Products Ltd	MAIL ORDER	427
523	PC Brand	MAIL ORDER	214-215
306	Tenex Computer Express	MAIL ORDER	429



PC MAGAZINE ADVERTISING SALES STAFF

One Park Avenue, New York, N.Y. 10016
(212) 503-5100

Director of Sales - Telemarketing - Nancy Newman
Telemarketing Manager - MaryJo Boudinot
Senior Advertising Coordinator - Allyson Dubin
Advertising Coordinator - Christine Holsten
Asst. Advertising Coordinator - Lynette Stiffa

Al Di Guido - Eastern Advertising Manager (212) 503-5310

MA, NH, VT, ME, RI

Sloan Seymour - District Manager
(617) 393-3055
10 President's Landing
Medford, MA 02155
Todd Anderman - Account Representative
(212) 503-5132

CT, NY, NJ, PA

Michael Bird - District Sales Representative
(212) 503-5307
Lisa Friedman - District Sales Representative
(212) 503-5149
One Park Avenue
New York, NY 10016
Joyce Wasserman - Account Representative
(212) 503-5333
Stephanie Brzozowski - Account Representative
(212) 503-5675

DE, MD, DC, VA, WV, NC, SC, AL, MS, TN, AR, KY, GA, FL

Scott J. Seltz - District Manager
Mark Crafts - District Sales Representative
3405 Piedmont Road
Atlanta, GA 30305
(404) 239-9780
John DeSpirito - Account Representative
(212) 503-5130

Robert Diftler - Central Advertising Manager (312) 346-7666

NE, WI, IL, IN, KS, MN, MO, OH, MI, IA, ND, SD, Canada

Stephen Dress - District Manager
Jay Overbye - District Sales Representative
150 North Wacker Drive
25th floor
Chicago, IL 60606
(312) 346-7666
Maureen Dooley - Account Representative
(212) 503-5126
Chris Sullivan - Account Representative
(212) 503-5047

TX, OK, LA, NM

Sandy Schackman - District Manager
5956 Sherry Lane Suite 625
Dallas, TX 75225
(214) 691-6934
Karen Keavey - Account Representative
(212) 503-5104

Ted Welch - Associate Publisher/West Coast (415) 378-5525

CA (San Francisco & North), ID, OR, WA

Mike Kisseberth - District Manager
(415) 378-5527
Rick Vandervoorn - District Sales Representative
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5523
Deborah Gatton - Account Representative
(212) 503-5129

CA (Santa Barbara to So. San Francisco), WY, MT, AK, CO, UT

Pete Foster - District Manager
Kim Dawson - District Manager
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520
John Zaterka - Account Representative
(212) 503-5041

CA (San Diego & Orange County), AZ, NV, HI

David Lynn - District Manager
Robin Kofsky - District Sales Representative
18500 Von Karman Ave. Suite 510
Irvine, Ca. 92715
(714) 852-8001
Michael Hatherill - Account Representative
(212) 503-5113

CA (Los Angeles)

Mary Arlotto - District Manager
Paul Klein - District Sales Representative
3530 Wilshire Blvd.
Suite 645
Los Angeles, CA 90010
(213) 387-2100
Beth Gartenberg - Sr. Account Representative
(212) 503-5040



COMING UP

The PC Magazine Hands-On Guide to Portable PCs:

■ 386SX AND DX BATTERY POWER

Vendors of portable computers have made "Smaller! Better! Faster!" their battle cry. For this reason, battery-powered 386SX and DX laptops have become favorites. At 15 pounds or less, they're reasonable machines to carry; with their 80386-class processors, they give you the power of a desktop system. You have plenty of options in this roundup of 24 go-anywhere laptops.

■ AC-POWERED 386 PCS

When massive storage space and color options take top priority, you need full DX power and a wall outlet. For running Windows 3.0 and handling power-hungry computing tasks at multiple sites, transportable PCs offer the versatility many battery-powered systems just can't handle yet. These ten AC-only 386s can easily double as desktop units.

■ 286 NOTEBOOK PCS

Traveling light? When an easy commute takes priority over power and storage space, you're likely to find your computing solution is a 286 notebook PC. Once you walk around for a while with one of these ten 7-pound-and-under travelers in your briefcase, you may be less reluctant to sacrifice some of the 386 portable's benefits.

■ 8088-CLASS NOTEBOOKS

Market leaders Compaq and Toshiba fight to be king of the hill; Psion shows a new type of lightweight, portable notebook PC. With lightweight and reasonably inexpensive 286s available now, is this platform still a viable option? *PC Magazine* helps you decide.

■ IBM'S P75 PORTABLE 486/33

You may be ready for 486 power-to-go now, but only the IBM P75 is ready for you. *PC Magazine* tests the only portable 486 with FCC Class B certification.

After Hours

Products for the Leisure Side of Personal Computing

Tax Prep Software for 1990 Emphasizes Abundant On-line Help And Graphical WYSIWYG Forms

PERSONAL FINANCE
by Laura Lou Meadows

Read my lips: We won't pay new taxes in 1990, but the current crop of PC-based tax return software makes the job of paying the same old taxes much more palatable. In our annual two-part look at software that helps you do your taxes, we examine eight programs that get you from a pile of receipts to a refund as quickly and as easily as possible.

Ease of use is of paramount importance in tax prep software; after all, who wants to use a program that adds the insult of additional difficulty to the injury of the year's most odious financial task? Since many personal tax programs are used only once by one person, designers must make the software easy enough to use that the taxpayer needn't invest hours thumbing through manuals or running thick/extensive tutorials.

That quest for (relative) simplicity is the theme that runs through many of this year's tax software upgrades. Almost all of the programs we've reviewed have added pull-down menus, pop-up windows, on-screen calculators, and some degree of on-screen help with the mechanical operations of the program. One package even stakes a claim for tax prep software in the brave new graphical world of Windows 3.0.

The real winners are the programs that do more than simply provide a tool to make sure you get the arithmetic right (no mean feat for humans, though it *should* be a snap for the PC). The best of the breed take a coherent approach, adding new features and

working thoughtfully to make the whole process easier for you. They harness the PC's power to tell you what you need to know—exactly when you need to know it. That includes help not only with software mechanics but also with substantive tax points.

Interestingly, the Internal Revenue Service has made at least one policy change that benefits users of all of the software reviewed here. The IRS has relented on its previous insistence that you file your return on a near-perfect replica of its own printed Form 1040. It now accepts a typed version, provided it meets IRS standards for underlining and legibility, as all of the programs that we review here do.

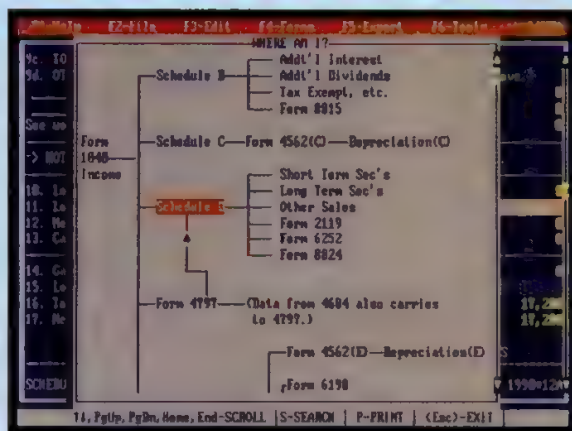
If you believe firmly that neatness counts, however, you may feel more comfortable with the options in several programs for reproducing a graphics printout of a 1040. Some of these look

like dot matrix output, even when coming from a laser printer, while others generate a form that only an expert could tell apart from real IRS issue.

Andrew Tobias' TaxCut

Like a mild-mannered Clark Kent, *Andrew Tobias' TaxCut* keeps its computational muscle under wraps, but the competence and power to get the job done are definitely there. Because of its elaborate help facilities, *TaxCut* has been the program of choice for the intelligent layman who wants guidance through the tough terrain of the tax rules. With Harvard tax lawyer Dan Caine's inspired "expert advisor" just a keystroke away, *TaxCut* helps shield users from the complexities that April 15 inevitably brings.

This year, *TaxCut* does its usual good job with the federal Form 1040 and 33 supporting



TaxCut's "where am I" chart shows you, in schematic fashion, how information in a particular form fits into the overall flow of data.

PERSONAL FINANCE

■ *Andrew Tobias TaxCut* soothes the 1040 blues

■ *Sylvia Porter's RapidTax*: A new contender from a familiar expert

■ *SwifTAX* offers the tools for efficient tax prep

■ *TurboTax*: a long time favorite gets even better

forms and schedules. But Meca Software has also added several valuable new functions and expanded the scope of the already superb expert advisor.

The expert advisor uses artificial intelligence techniques to guide you, question by question, through completion of a specific item, form, or schedule for your return. The advisor provides explanations of tax terms and typical examples of circumstances under which a deduction is allowed or disallowed.

Say, for instance, that you are a musician and report your performance fees on Schedule C. You use your den exclusively as your practice studio and want to deduct the den's share of your rent. The expert advisor leads you through each required element for deduction, explaining, for example, that the den might satisfy the "principal place of business" test if no other studio was provided, even though your performances were given elsewhere. If you take comfort in the official word, you can pop up a window with an edited version of the IRS instructions for each form.

If you're uncertain about just

CONTINUES

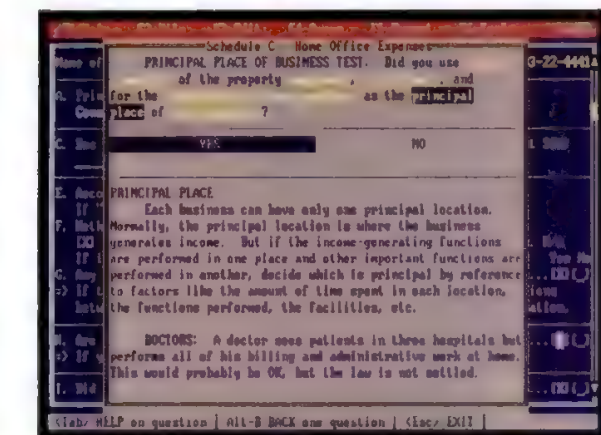
After Hours

Tax Prep Software

CONTINUED

which forms you need to fill out, you can turn to *TaxCut*'s checklist of interview-style questions about your income, deductions, credits, and payments. It either generates a list of the forms you'll need, or lets you fill in pertinent forms immediately before returning you to your place in the checklist.

What if you run such a tight ship that you've already put your whole year's worth of income and expenditures, complete with tax classifications, into such a program as *Andrew Tobias' Managing Your Money* (either Version 6.0 or the newest, 7.0)? You are in clover! *TaxCut* can import the tax-classified numbers and practically complete an entire tax return in one pass. Now this is what life in the brave new



The "expert advisor" is one of *TaxCut*'s best features. This elaborate help facility defines important terms and gives plenty of helpful examples.

out where to enter such items as interest income on a Form 1099 from your bank or the payout from your retirement plan.

Where is all this taking you? The new chart called "where am I" shows you, in schematic fashion, how information in the form you're working on fits into the flow of data from the dozens of subschedules and sub-subschedules behind the summary figures on the 1040. If the form you're trying to find isn't visible initially on-screen, the chart is searchable by form number or by scrolling up or down.

When you think you have it all together, you run the auditor and the *TaxCut* expert produces a report. This report lists inconsistencies and missing data, and places

audit flags wherever your figures depart significantly from IRS published norms. The auditor also offers tax tips for saving money on your facts for next year. For future years, the tax-planning feature lets you compare this year's key numbers with up to three other scenarios simultaneously.

Printout time is the moment of truth. *TaxCut* has the best

printing options of all the personal tax programs on the market. It prints a complete tax return in three different styles acceptable to the IRS. The simplest combines the ordinary typewriter Courier typeface with an IRS-approved page arrangement, and will print on any printer. There is also a graphics-quality Form 1040 that prints on a Hewlett-Packard laser printer without any special font cartridge and, mirabile dictu, we're told the final version of the program will contain *LaserLink* downloadable soft fonts that produce professionally precise replicas of the Form 1040 and 14 other of the most commonly used forms.

To file your *TaxCut* return electronically, write it to a floppy

disk in drive A:, then mail the disk off to Universal Tax Systems in Virginia with your check for \$19.95 for transmission to the IRS computer.

Compatible programs for ten states are available that will pick up all the data you've entered into the federal program, ready for you to make any additions and modifications required by your state. The \$39.95 includes the *LaserLink* fonts for the state signature forms.

Like all good software publishers, Meca Software realizes that its product must be significantly improved from year to year or it will be overtaken by the competition. With its all-encompassing help features and beautiful output, *TaxCut* for 1990 sets quite a standard for the competition to live up to.

List Price: *Andrew Tobias' TaxCut*, \$89.95. State programs, \$39.95. Electronic filing service, \$19.95. **Requires:** 512K RAM, 3.5MB of free hard disk space, DOS 3.0 or later. Meca Software Inc., 327 Riverside Ave., Westport, CT 06880; 203-222-9150.

CIRCLE 423 ON READER SERVICE CARD

Sylvia Porter's RapidTax

RapidTax represents DACEasy's expansion into the tax preparation field. To build on the wide acceptance of its popular accounting packages, DACEasy acquired a well-tested tax return

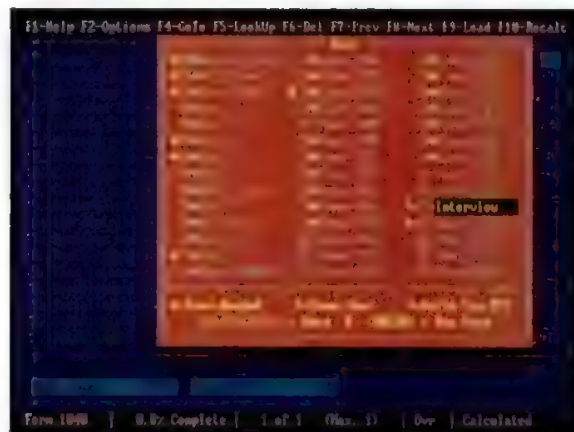
CONTINUES



This year, two programs stand out for their sheer intelligence and good sense in anticipating your needs as you plow through your yearly staring contest with the Form 1040. *Andrew Tobias' TaxCut*, from Meca Software, and *TurboTax*, from ChipSoft, concentrate on simplifying operations and making understandable tax assistance available where and when you want it. No wonder that last year *TaxCut* sold over 100,000 copies and *TurboTax* sold over a quarter of a million copies. Nobody else comes close.

computerized world is meant to be. *TaxCut* also imports from *Checkwrite Plus*, *Quicken*, *Lotus 1-2-3*, and ASCII files, but only one item at a time.

On the other hand, if neatly classified records are not your strong suit, you can sit down with your shoebox full of disorganized receipts and use *TaxCut*'s "shoebox" feature. This approach helps you figure



RapidTax checks off forms you will need on the basis of your responses to interview questions.

After Hours

Tax Prep Software

CONTINUED

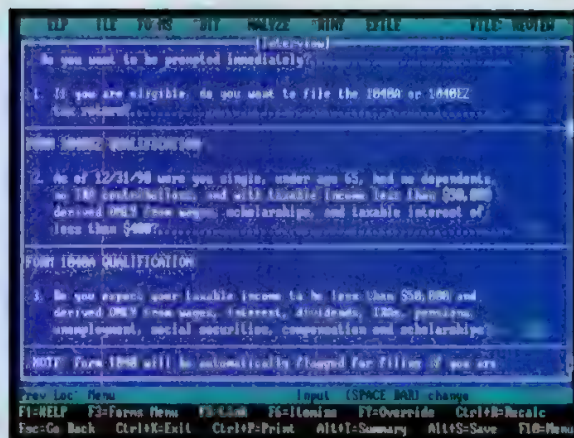
program from a regional accounting firm and is taking it national this year with the endorsement of the noted financial columnist Sylvia Porter.

RapidTax is a good, solid program that does a fine, workmanlike job of coherently pulling together your 1040 and an array of 33 federal supporting forms and schedules. Its brisk on-screen tutorial explains the basics of how to operate the program. From there, you choose "forms" from the brief main menu and, after entering the name, rank, and serial number fundamentals, either go to the form you want or take the interview. The interview poses questions and either accepts your brief answers (to appear on the forms later) or asks if you would like to go directly to the form that deals

numbers of the forms but neglects to mention their title or purpose.

The depreciation worksheet is capable of doing the full calculations but is somewhat quirky and inflexible in operation. The tax help screens are brief, sometimes giving a useful reference to a pertinent IRS publication, sometimes telling you to do the very thing that the program has already done automatically (such as carrying information to the alternative minimum tax Form 6251). But it fails to specify a line where you have to enter the information yourself. At least it serves as a useful cross-reference. A pop-up calculator lists items on-screen as you enter them and has a "get and put" feature.

A unique feature of *RapidTax* is its ability to split a joint return (you need to code each item as taxpayer's, spouse's, or joint as you enter it) into two married people filing separate returns to let you see if there is a savings. There is seldom a savings on the federal return from filing sepa-



The Spacebar toggles among the three possible responses to questions in *Swiftax*'s preliminary interview, which helps you choose forms.

rating is supported.

RapidTax will competently take care of your yearly tax chore, but it lacks the sophisticated user interface and plentiful help of category leaders like *TaxCut* and *TurboTax*. With the resources of DACEasy behind it, however, this package should show rapid improvement in future versions.

List Price: Sylvia Porter's *RapidTax*, \$79.95. Regional module with six to nine state programs, \$49.95. Electronic filing service, \$20. **Requires:** 512K RAM, 3.5MB free hard disk space, DOS 2.1 or later. DACEasy Inc., 17950 Preston Rd., #800, Dallas, TX 75252; 800-877-8088.

CIRCLE 424 ON READER SERVICE CARD

Swiftax

Swiftax gets off to a fast start with a clear, very succinct tutorial that helps you use the program to prepare your return. It also provides information about tax law changes and how they are likely to affect you this year.

An interview asks you the questions that determine which forms you need to complete. You use the space bar to toggle among yes, no, or ? as your answer. As you go along, *Swiftax* tells you the IRS numbers of the necessary forms, and checks them off on the forms menu. After you've made the entries you have in mind, the "forms status" feature lays out an informative chart that shows the degree to which you've completed the forms that satisfy your interview answers.

There is concise on-line help for both program operations and tax substance.

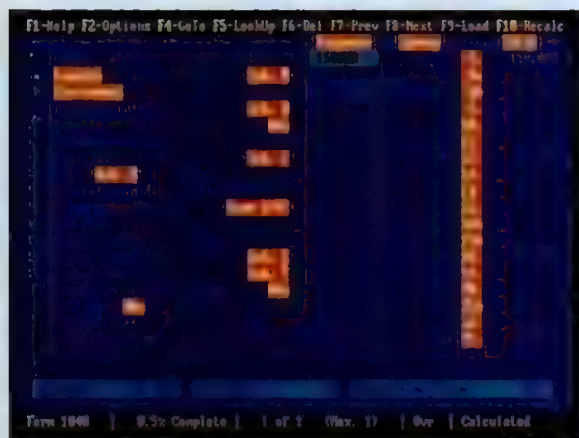
For simple, average returns, *Swiftax* is likely to do a decent job without dragging you through a morass of tedious detail. But when you get to such items as depreciation or passive activity losses, where you can really use the computer's power to assimilate detail and crunch numbers, *Swiftax* cops out or fouls up.

For example, the program includes the depreciation Form 4562 but doesn't figure out the amount of the depreciation deduction. You calculate the deduction yourself, put it on the 4562, and *Swiftax* carries on from there. It feels like a restaurant with bus boys but no chef—perfectly fine if all you want is the salad bar.

Swiftax accepted my scenario's \$50,000 loss on a pre-1986 rental property on the partnership K-1 input sheet. But it neglected to run the loss through the Form 8582 passive activity loss limitation formula and wrongly reflected the full amount as a loss on Schedule E and deducted it in full on the 1040. I phoned *Swiftax*'s technical support number and asked if the K-1, 8582 and Schedule E were operational in my early-bird version. "Yes, they are complete now," was the reply.

Swiftax's data integrity check feature serves as the auditor when you've finished your return. I

CONTINUES



RapidTax can tell you if you will save money if you and your spouse file your returns separately.

with a specific tax item.

After you complete the interview, a checkmark appears on the forms menu next to each form that your answers indicate you'll need. To get you from here to there a little quicker, you can forgo the interview in favor of a questionnaire that covers the same territory but limits you to yes/no answers and creates checkmarks on the forms menu for later reference. *RapidTax*'s forms menu lists the letters or

ately, but tax rules in some states occasionally produce tax savings for married couples who elect to take this approach.

RapidTax's compatible state tax return programs are packaged by region, with six to nine states in a package for \$49.95. Print options are limited to Courier typeface versions of the forms, or the information is arranged so that it can be photocopied using transparent overlays of a Form 1040. Electronic

After Hours

Tax Prep Software

CONTINUED

was pleased to see it noted my deliberate error in entering an excessive \$4,000 social security tax payment, but why did it let me enter an excessive amount in the first place without using an override? Other programs pick up such simple stumbles when they happen.

On a laser printer without any special font cartridges, *Swiftax* prints a graphics 1040 in dot matrix style, with other forms in Courier typeface; all are IRS-acceptable. If you'd like to file electronically, send your *Swiftax* file by modem or mail and send your check for \$20 (along with the Form 8453) to TenKey Publishing in Florida. There are compatible state programs for 24 states at \$39.95 each.

We must insert a caveat about *Swiftax*'s confusing pricing policy. The "early-bird" version,

which has been on dealers' shelves since late last year, lists for \$39.95. Sounds like half the price of the market leaders, doesn't it? But the early-bird version has the IRS's early draft version of the forms that came out in mid-1990, not the final ones that you can file. To get *Swiftax* with the official (file-

able) forms, you need to send the publisher, Timeworks, an additional \$24.95, which brings the total list price to \$64.90. That saves you a bit off of the final version's price of \$79.95, but it still seems like an unduly complicated and somewhat misleading procedure. By the standards of earlier years, *Swiftax* might

get by. But in today's competitive world, given steadily improving software from other publishers, this race is not always to the *Swiftax*.

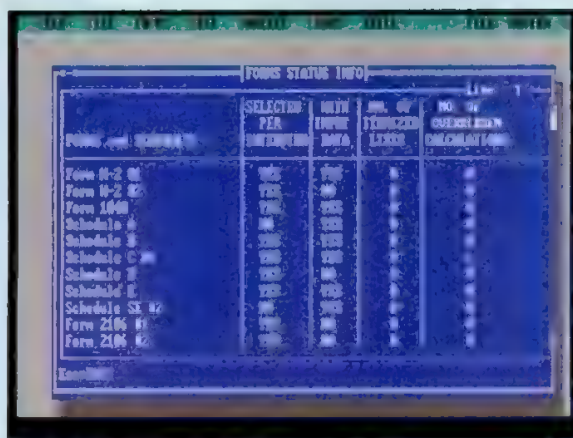
List Price: *Swiftax*, \$79.95.

State programs, \$39.95 each.

Electronic filing service, \$20.

Requires: 512K RAM, 1MB free hard disk space, DOS 2.1 or later. Timeworks Inc., 444 Lake Cook Rd., Deerfield, IL, 60015-4919; 708-948-9206.

CIRCLE 426 ON READER SERVICE CARD



Swiftax's "forms status" feature shows your progress toward completing the forms that are suggested by your interview answers.

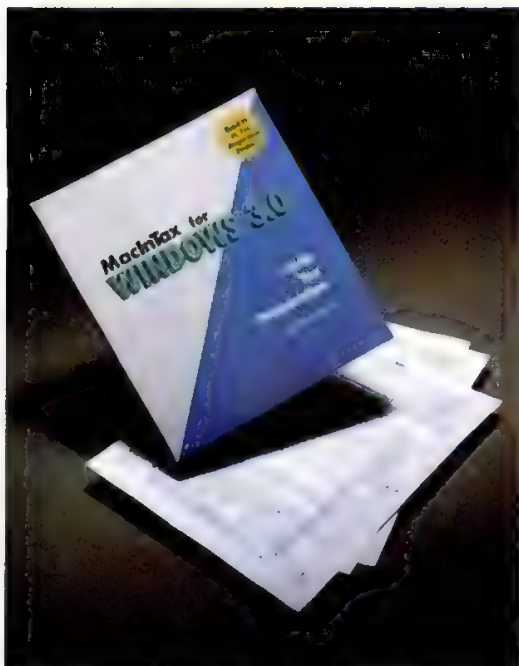
TurboTax

For the past several years, *TurboTax* has been fast, fearless and powerful, a veritable Clint Eastwood of tax return software. Its tone has been official, with more action than chat. The new personal *TurboTax* for 1991 obviously spent the off-season at finishing school, because this year its approach is engaging and helpful.

The first series of screens has windows labeled "logical next step." Here you find recommendations both for new users (the

CONTINUES

MacInTax for Windows Has It All



MacInTax® for Windows™ 3.0 is the most advanced personal tax preparation software on the market today. Thousands of Windows users have already made it their choice, which makes sense because it's the only tax product that really takes advantage of the *magic* of Windows, delivering unequalled power and ease-of-use.

MacInTax replaces archaic command sequences and menus with point-and-click ease. Double click your mouse and access on-line IRS instructions, helpful hints, and any of the over 80 forms, schedules, statements and worksheets. Form linkages, calculations, audit and error checks are all on-line as you enter data — saving you time and effort. And the forms that you complete on screen are picture perfect when printed out — ready for submission. See for yourself why *InfoWorld* rated MacInTax the #1 tax product in 1989!

Only \$99! Order before April 15, 1991 and get your very own Personal Tax Analyst (including 1991 tax updates) absolutely FREE. Call now: (800) 622-6829.

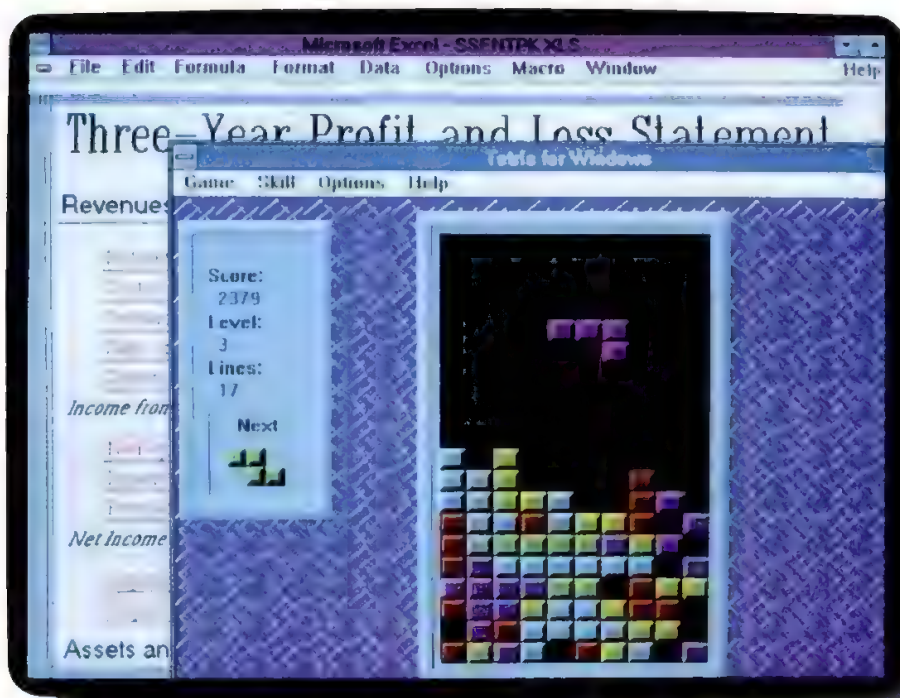
All ® registermarks and ® trademarks are of their respective companies.
©1990 Softview, Inc. All rights reserved.

30-day money back guarantee.
No questions asked.

CIRCLE 539 ON READER SERVICE CARD

S O F T V I E W

Now you can use the incredible power of Windows 3.0 to goof off.



The New Microsoft® Entertainment Pack for Windows™ gives you seven spiffy games. Each one designed for pure, unproductive fun. And all accessible in seconds from any other Windows product.



Which means you can go right from juggling numbers, to juggling those funny little blocks in TETRIS™. Another click of the mouse, and you can go from typing a letter to testing your nerves on Minesweeper. Or honing your skills on TicTactics.

Or becoming seriously addicted to one of two new kinds of solitaire.

Equally entertaining is IdleWild, the screensaver with seven radical selections. From a race through space, to a pattern that slices, dices, and scrambles your screen.

Now get to work. Call us at (800) 541-1261, Dept. P12, and ask us all about the Entertainment Pack. We'll do our best to give you a completely frivolous answer.

Microsoft
Making it all make sense®

After Hours

Tax Prep Software

CONTINUED

tutorial) and old hands (read what's new). Then a logical next-step window suggests that you select the interview if you need substantive tax help, or that you proceed directly to the forms menu if you don't.

As you take the new and expanded tax interview, you see just how accommodating *TurboTax's* new personality can be. If your answer to any question indicates that you'll need to fill out a particular form, the form instantly appears behind the window.

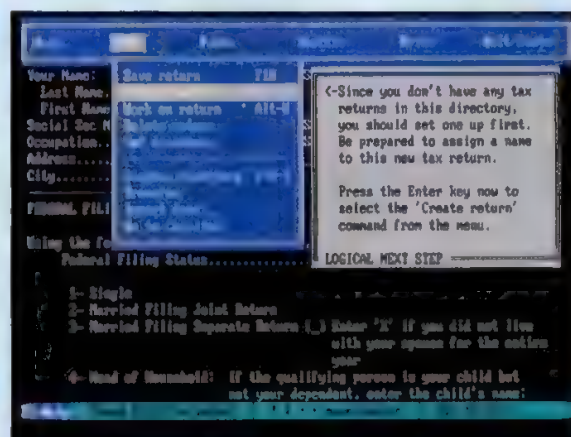
Then you are given the opportunity to fill out the form immediately and resume the interview after the detour. Do it now! *TurboTax* has reached a new high in flexibility; getting back to where you were in the interview is as simple as tapping Alt-I.

When you're at work on a

form and have a question about an entry, you have two sources of help: the official IRS instructions or the new "consult with TurboTax" feature. The official IRS instructions that we've seen pop up in years past were not in our head start version but are slated for the final edition. The consultant, sounding like an

obedient genie emerging from a bottle, speaks directly to you in the first person, as in "I'll answer any questions you might have on Schedule B. Just place the cursor on the item you'd like more information about, then press F1."

While most programs' explanations would leave you



TurboTax features "logical next step" windows that gently step even novice users through the process of completing their returns.

cowering before threatening technical terms, *TurboTax*—borrowing a technique from *TaxCut*—highlights words or phrases that can be more fully explained. Pressing Enter opens another window containing a straightforward explanation that anticipates your questions and briefly lays out the alternatives.

If you have a question in mind but don't want to go through an interview to see if it comes up, you have several other choices. Say, for instance, you have some income from a trust. Use the "find tax form" feature to open up a list of 500 alphabetized words and phrases and look under "trust." A second window lists half a dozen forms that could be affected. (The "find tax topic" feature works the other way around.) If you want more than just a form number, try looking in the new "file cabinet" feature.

The file cabinet lists a "trust information" folder. Confirm your choice by pressing Enter and the K-1 worksheet for trusts

CONTINUES

COMPUTER IMAGES

Super VGA

Also VGA/SVGA/EGA/High and Low Resolution

1024x768x256

Unsurpassed Quality Real Color Images

**ASTRONOMY • NATURE • SCIENCE
FULL COLOR VIDEO MOVIES
"OTHER HEAVENLY BODIES"**

Improve your computer's maximum image clarity. Get images for IBM, APC II, Atari, Amiga, and most other systems in all resolutions from 320x200 all the way to 1024x768x256 colors. State of the art!

TWO WAYS TO BUY OUR IMAGES

24 line BBS: 503 607-5100 • You have full unlimited access to 1400+ megabytes of images and programs on our on-line BBS. Call BBS: 503-607-5100. 24 hours a day, 7 days a week. No charge for local connections. Call for your local number.

CATALOG MAIL ORDER: 503 607-5100 • Save long distance phone charges. Order anything found on line thru our Mail Order Catalog. Worldwide shipment. Credit card, cash, check. Same day shipment. US/MX, 12% FIDELITY, no foreign orders.

Event Horizons
311 Ave B, Suite 200
Laini Oswego, OR 97056
Information: 503-607-5100



 2

 After

 Hours

 is where

 PC Magazine

 readers take

 their fun

 and games

 seriously.



 Advertisers interested in

 reaching them should call

 800 33 MAG AD.

GET READY FOR THE GRAPHICS ISSUE

PC Magazine's Single Subject Special

It's the complete solution for those selecting business graphics products. This stunning issue will feature —

- Presentation Graphics Packages
- Clip Art Libraries
- Film Recorders
- Slide Services

You'll find all this and more in the eye-catching May 14 Issue of *PC Magazine*.

• Advertisers interested in this exciting opportunity should call 800 33 MAG AD now. Ad Closing: 3/19.

The PC Magazine logo is located in the bottom right corner. It consists of the letters "PC" in a large, bold, white sans-serif font, stacked above the word "MAGAZINE" in a smaller, white sans-serif font. Both are set against a solid red rectangular background.

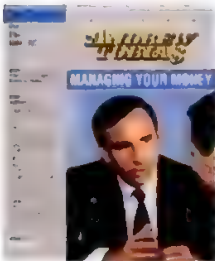
MEETING OF THE MINDS



ANDREW TOBIAS—

financial expert and best-selling author—developed Managing Your Money to become your financial control center. It's the only program to bring all the tools you're ever likely to need under one roof. Tools for your checking, banking, tax planning and portfolio management demands in one intuitive, fully-integrated package. So you don't have to buy a dozen separate programs or enter the same information more than once. Now in its 7th Edition, and with over 500,000 users, Managing Your Money continues to set the gold standard for financial software.

"Nothing beats Managing Your Money."
—PC Magazine "The king of finance software."
—PC Computing



DANIEL CAINE—

tax expert and artificial intelligence pioneer—developed TaxCut to let you prepare an expert-quality tax return yourself. Unlike any other tax software, TaxCut uses artificial intelligence to let you interact with Dan Caine while you prepare your return. His professional experience is available with a keystroke as you fill in forms on-screen.

Or let him guide you through an interview designed to find your best tax strategy. When you've completed your return, TaxCut's Expert will audit the result for deductions you may have missed and any entries which might trigger an IRS red flag. Last year's dark horse, TaxCut was ranked 1st by both Business Week and Money Magazine.



LIMITED-TIME MONEY-SAVING OFFER

Managing Your Money and TaxCut work together effortlessly. Use Managing Your Money throughout the year to organize your tax records. Then, as April 15th approaches, transfer your data with a keypress off the TaxCut menu to print, sign and file a completed return.

For a limited time only, these two expert software products—usually sold separately—can now be purchased together at **unprecedented savings** for you. Hurry to your favorite dealer! Ask for the **Managing Your Money/TaxCut Special Combination Pak**. Supplies are limited.

meca® For 512K IBM® PC's and compatibles. Hard disk drive recommended.
© 1991 MECA Software, Inc. P.O. Box 907 Westport, CT 06881 Phone: 203-222-9150



INDEX TO ADVERTISERS

RS #	ADVERTISERS	PAGE	RS #	ADVERTISERS	PAGE	RS #	ADVERTISERS	PAGE
293	3 Com	356-357	236	Fifth Generation	309	*	PC Connection	248-253
234	3X USA	401	288	Fifth Generation	165	188	PC Globe	88
172	Abacus	16	286	Fifth Generation	255	*	PC Zones Int'l. Inc.	303-304
519	Acer America Corporation	297	282	First Source International	429	343	Performance Memory Products	432
130	Acma Computers, Inc.	320-321	*	Gateway 2000	48A-H	147	Plus Development	125
165	Advanced Logic Research	2-3	339	Group 1 Software	28	148	Primavera Systems	68
197	Advanced Micro Devices	409	171	GSS / Spectragraphics	416B	259	QMS	5
251	Apple Computer	404-405	276	Hauppauge Computer Works, Inc.	32	*	Quill Corp.	233
336	Arlington Computer Products	433	*	Hard Drives International	418	290	Rose Electronics	346
254	Artisoft	372	*	Hard Drives International	434	124	Roykore, Inc.	232
*	Ashton Tate	185	313	Helix Software	51	316	Samsung Information Systems	128
727	ASP Computer Products	274	118	Hercules Computer Technology	228	296	SAMTRON	66
540	ATI Technologies Inc.	226	*	Hewlett Packard Peripheral Group	188-189	*	Seagate	159
*	Attachmate	265	*	Hewlett Packard-Vectra	162	490	Seiko Instruments	39
509	Austin Computers	9-13	*	IBM Corp.	300	193	Sharp Electronics	388-389
476	Automated Computer Tech. (A.C.T.)	42	*	IBM Corp.	89	160	Sigma Data	354
287	Borland International	57	325	IQ Engineering	21	724	Softlogic Solutions	391
285	Borland International	59	749	Intel (PCEO)	272-273	539	Softview, Inc.	462
328	Buffalo Products	384	374	Intel (PCEO)	70-71	373	Software Add-Ons	419
481	Bulldog Computer Products	428	*	Intel (PCEO)	331	393	Software Link, Inc.	80
180	Bureau of Electronic Publishing	4	512	Intel (PCEO)	333	*	Software Publishing	358
273	Bus Computer	420	378	Iomega Corporation	230-231	337	Sony Magnetic Products Co.	367
522	Calera Recognition Systems	318	480	Iverson Computer Corporation	61-63	539	South Coast Electronics	429
187	Canon, USA	403	530	Jet Fax	96	346	Speciality Software	299
128	Capital Equipment Corporation	373	190	Key Tronic	350	103	SPSS, INC.	326
348	Chipsoft	468-469	220	Kensington Microware Ltd.	291	731	Stac Electronics	217
178	Clarion Software	381	143	Lotus - Word Processing Division	131-134	163	Standard Computer (CPU)	98-101
516	CMO	258-259	*	Lotus Development Corp.	104	268	Swan Technologies	141-144
132	COMP. U.S.A.	52-53	136	M-USA Business Systems, Inc.	76	299	SWFTE International	37
109	Computer Discount Warehouse (MMC)	423	511	MicroTac Software	373	264	Symantec	398
739	Compex, Inc.	97	263	Macola Inc.	324-325	344	Symantec	26
*	Compu-Add	153-156	291	Map Info	199	209	Symantec	160-161
*	Compu-Add	220-223	*	Mark Williams	257	184	Symantec	210-211
*	Compu-Add	361-364	495	Maynard Electronics	394	312	Tandon Computer Corporation	200-201
*	Compu-Add	424-425	376	Meca	216	744	Tandon Computer Corporation	202-203
205	Compuclassics	54	382	Meca	465	333	Tandon Computer Corporation	204-205
315	Concentric Data Systems	193	307	Micro National	435	391	Tangent Computer, Inc.	111
729	Corel Systems	198	390	Micro Solutions	397	206	Telemart	90-93
502	DAC Easy, Inc.	126-127	*	MicroLab	22-23	306	Tenex Computer Express	429
504	DASTORM Technologies Inc.	261	225	MicroWarehouse Inc.	172-175	750	Texas Instruments	292
389	DCA	262-263	*	Micrografx	20	169	Toshiba of America	171
*	Dataworld	177	*	Microsoft	463	121	Tri-Star Computer	17
*	Dataworld	179	*	Microsoft	18-19	177	Ultra Comp	40-41
*	Dataworld	181	*	Microsoft	310-311	367	Universal Data Systems	240
470	Dell Computer Corporation	72-73	*	Microsoft	C2-C4.p.1	230	US Sage	245
532	Dell Computer Corporation	348-349	*	Microway	45	*	Ventura Software Inc.	151
*	Dell Computer Corporation	471-472	489	Midwest Computer Works	426	*	Wordperfect	64
536	Dell Computer Corporation	C5-C8	248	Mirror Technologies	186	255	Wordstar International	379
250	Delrina Technology	213	142	Mouse Systems	227	112	Wyse Technology	47
347	Dustin Discount Software	14	120	Mouse Systems	229	211	Xircom	77
332	Dynamic Microprocessor Assoc.	74	*	NBI, Inc.	168-169	199	XTREE-Div of Executive Systems	166-167
362	Eastman Kodak	194-195	157	NEC Technologies, Inc.	190	732	Zenith Data Systems	86
366	Enable Software Inc.	206	153	NEC Technologies, Inc.	24-25	723	Zeos International	29
*	EPS Technologies	84-85	395	NEC Technologies, Inc.	347	493	Zeos International	30-31
*	EXCEL MICRO	432	394	NEC Technologies, Inc.	82	721	Zeos International	78-79
*	Epson	368-369	329	Nikon Inc.	196	*	Zeos International	113-120
479	Ergo Computing Inc.	182-183	*	Northgate Computer Systems	234-239	115	Zeos International	121
107	Everex	312	235	Okidata	294-295	388	Zeos International	268-269
113	Everex	382-383	*	Oracle	94	*	Zeos International	337-344
*	FASTMICRO	416C, 416D-417	*	Pacific Data Products	317	487	Zeos International	392-393
123	FTG Data Systems	397	145	Paradise Computer Products Ltd	427			
126	Future Soft engineering	242	523	PC Brand	214-215			
*	Fifth Generation	307	303	PC Brand	275-286			
			368	PC Brand	430-431			

* No Reader Service #. Please call advertiser for information.

After Hours

Tax Prep Software

CONTINUED

appears. For the scoop on how to fill out the trust K-1, punch up the consultant with F1 and a window with 22 scrollable pages materializes. The page that comes up in the window is the one that pertains to the line on which the cursor rests.

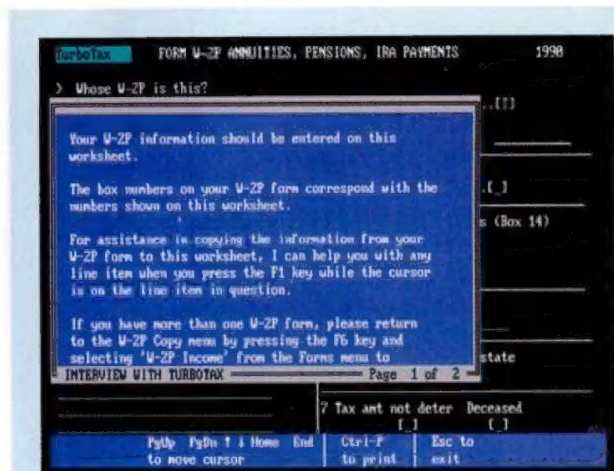
For sticky areas like depreciation and passive activity losses, *TurboTax* has what may be the most thorough worksheets available in a personal tax return program. It also has fine facilities for importing data from personal finance programs and ASCII files.

If you'd like the reassurance

of looking at screens with an uncanny resemblance to the IRS forms themselves—in black on white with all the boxes right there—select *TurboTax*'s graphics mode from the "monitor options" menu.

When you think you've finished your return, *TurboTax*'s data examiner lists anything left incomplete on the forms you've used. The U.S. averages feature tells you what the average taxpayer in your bracket deducted for various items. The IRS audits command pinpoints factors, if any, that might precipitate a tax audit. The tax savings function presents hints, based on your income picture, for reducing taxes in the future.

ChipSoft offers a separate \$40 program for each of the 44 states that have an income tax. The state forms sleekly carry



As you complete its interactive "interview," *TurboTax* automatically pops up forms you may need to fill out.

over all the data that you entered when you completed the federal program. The state program rearranges the data to fit the state

tax forms, then adds any local modifications you feed it.

When it's time for your printout, *TurboTax* offers a graphics replica of the Form 1040 that will print on either a dot matrix or laser printer without any special fonts. For the supporting forms and schedules, the usual typeface printouts meet the IRS standards.

When you're ready to think about next year's tax bill, there is a "what if" feature that compares various scenarios.

If you would like to file your return electronically for a faster refund, you'll need to buy the separate *ChipLink* software (\$11.50) that is scheduled for release on February 3 and, for the actual transmission, pay \$20 to Nelco Inc., the company with the big modem that sends everything on to the IRS.

TurboTax just seems to get better with age. ChipSoft has made the package much more accessible and considerably easier to use, without sacrificing any of its efficiency or power. *TurboTax* serves as an example not only to other tax software publishers but also to software publishers in general. ■

List Price: *TurboTax*, \$75. State programs, \$40 each. Electronic filing software, \$11.50. Electronic filing service, \$15 per return. **Requires:** 512K RAM, 2.2MB of free hard disk space, DOS 2.0 or later. ChipSoft Inc., 6256 Greenwich Dr., #400, San Diego, CA 92122; 619-453-8722.

CIRCLE 426 ON READER SERVICE CARD

ELECTRONIC FILING MOVES SLOWLY BUT SURELY INTO THE '90s

by Laura Lou Meadows

Over 4 million tax returns were filed electronically in the 1990 tax season, the first year the IRS offered the option nationwide. It's clear that this time-and-paper-saving technology is here to stay.

The benefits are as numerous as they are obvious. Entire forests are saved from ending up as warehouses full of yellowing returns on file. The IRS is saved from the frequent inability to retrieve a paper return from storage at audit time. The IRS also saves the substantial yearly labor cost of reading over 100 million paper 1040s and then typing the information into the IRS computers, not to mention the human error inherent in this process.

To encourage you, the taxpayer, to do your electronic bit, the IRS promises to acknowledge that your electrons arrived in readable form and to get your refund to you faster. The acknowledgement is within a matter of hours, or a few days at most. The IRS hustles your refund along via an electronic deposit to your bank account,

if you have one, within 10 days to two weeks. If the IRS has to mail you a paper check, it takes a week or so longer.

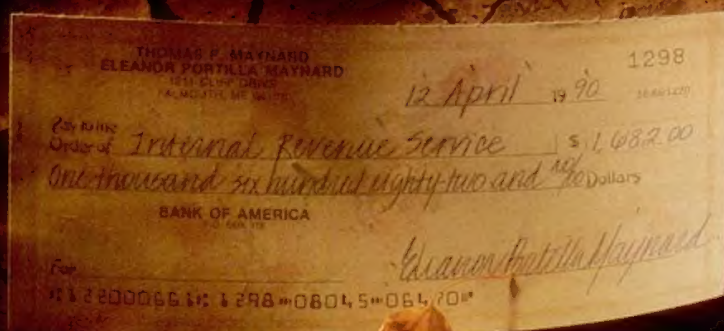
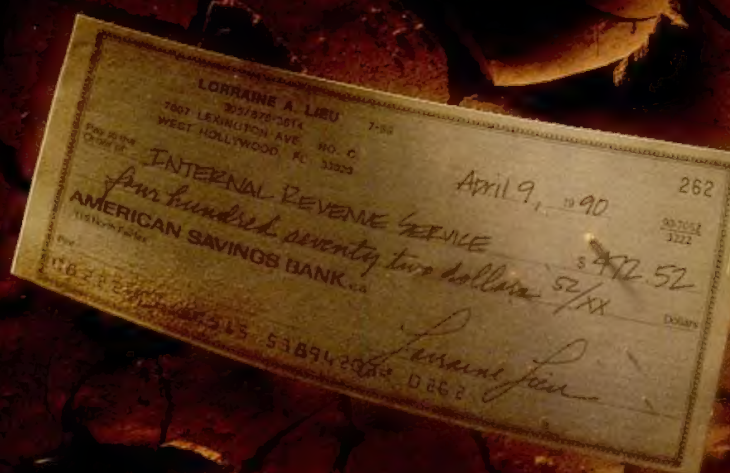
What if you owe Uncle Sam instead of vice versa? Can you file your return electronically and pay separately? By credit card, perhaps, or by authorizing an electronic payment from your bank account? Yes, but only if you live in one of the states where the IRS is running its pilot tests on balance-due returns. At press time, the pilot states included Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Electronic filing for returns with a balance due should be available nationwide in a few years.

Can you file electronically with one of the tax programs reviewed here that support electronic filing? Yes, but not by yourself. You will need to take your floppy disk to a professional tax preparer or transmitter who has been approved by the IRS to submit returns electronically. Since this requires the purchase of expensive additional software, and also

requires a 4,800- or 9,600-bit-per-second modem (priced from \$800 to \$1,500), the transmitter will charge you a fee, usually between \$15 and \$30. The transmitter is also responsible for some administrative matters like mailing your signature to the IRS on Form 8453 and informing you that the IRS has acknowledged the transmission of your return.

Whoa! Mailing a tax return costs 25 cents. Why should it cost you \$15 to \$30 to file electronically when it's supposed to be more efficient? Why can't the IRS approve transmitter's software and 2,400-bps modems that are compatible with the installed base of modems now sitting in the 50 million computers in this country? With these few simple changes, you (or your tax accountant) could file electronically for the cost of a simple phone call.

Because, says the IRS, of things having to do with pilot programs, further testing, and fear of dealing with its computerized public. Are these good reasons? They don't sound very convincing. ■



WHOEVER SAID IT THAN TO RECEIVE WAS

It's better to give than to receive, but there comes a point when paying taxes, that even the most generous among us must draw the line.

Say hello to TurboTax®. The tax preparation software for the IBM® PC and Macintosh® that's just what you'll need to help you draw that line.

It's the software with quite an impressive track record. It has won the PC Magazine Editor's Choice Award. And the PC World World Class Award for 5 years in a row.

The reason for all the accolades? TurboTax is like having a tax expert hold your hand while you prepare your taxes.

TurboTax comes complete with over 60 easy to understand federal forms, schedules and worksheets. Easy to understand because TurboTax uses a new hypertext help feature to translate tough tax instructions into plain English.

It lets you compare various tax scenerios. Juggle the figures. Move

around deductions. Declare a stock loss this year? No, next year would be even better.

TurboTax guides you to the appropriate line, and shows you how to enter over 90 types of income and expenses. It warns you if any of the numbers you're claiming might flag the IRS. It will proof your return in over 250 areas to check for mistakes in logic, calculation, and identify any potential missed savings opportunities.

It's even a math whiz. All the

Our new 386's pull a fast one on pricier computers. Both the 33 MHz Dell System® 333D and 25 MHz Dell System 325D are faster and more expandable than most higher priced systems.

The new Dell® 325D is a fast, reliable machine with up to 16 MB of RAM on the system board and a 32 KB cache designed into a compact footprint.

The new Dell 333D is as good as a 386 PC can get. Not only is it 33% faster than the Dell 325D, it has a 64 KB cache for an extra kick in performance.

We design every machine to our specs, then build it to yours. We design our computers; we know them inside out. So when you call us, we can talk to you about what you need a computer for, and then put together the most efficient, economical package for you. We take you through all the choices you have in memory sizes, monitors, storage devices, high performance controllers and accessories. Once you agree about exactly what you need, we immediately begin custom configuring your computer, perform a completed system test, then send it off.

Then you get 30 days to use it. If you aren't satisfied, send it back. We'll return your money, no questions asked.

Even if something goes wrong, it won't wreck your day. Actually, one of the nice things about our service is that you'll rarely need it. Another PC Week poll category we dominate is the one called "reliability"—due in no small measure to our extensive burn-in testing on each computer before it goes out the door.

But, for the sake of argument, let's suppose something does go wrong with your Dell computer. Both the Dell 333D and 325D come with our SmartVu™, the built-in diagnostic display, that ingeniously identifies problems even if the monitor goes down.

If you still need help, our Dell toll-free technical support hotline solves 90% of all problems over the phone, often within 4 or 5 minutes. Or, if you use our new Dell TechFax line at 1-800-950-1329, we'll fax back technical information immediately.

If we still haven't solved the problem, we'll send trained technicians from the Xerox Corporation[△] to your desk the next business day with the solution in hand.

For sale, for lease,[°] for less. Call us. Talk to a computer expert whose only job is to give you exactly what you want in computers, service, software, printers and financing. You'll get solid information that could save you time and money on computers with high marks, not high mark-ups.

TO ORDER, CALL	DELL COMPUTER CORPORATION
800-284-7711	
HOURS: 7 AM-9 PM CT M-F 8 AM-4 PM CT SAT.	
In Canada 800-387-5752. In the U.K. 0800 414535. In France (1) 30.60.68.00. In Germany 06103/701-0. In Sweden 0760-713 50.	

TOP OF THE MARK.



The new Dell 33 MHz and 25 MHz 386 computers.
System includes: VGA Color Plus monitor, 100 MB hard drive, 4 MB RAM.

TOP OF THE MARK-UPS.



Compaq's 33 MHz and 25 MHz 386 computers.
System includes: VGA Color monitor, 120 MB hard drive, 4 MB RAM.

So what do you get by paying the extra mark-up for a Compaq?

Not a better computer. Dell's new 386™ systems are as fast, expandable and compatible as Compaq's.

Not better service. In 8 straight *PC Week* polls of corporate customers, Dell's service rated much higher than Compaq's, as well as everyone else's.

Not better personal attention. From the moment you first call us, and for as long as you own your computer, we'll work with you custom configuring your computer and answering any questions—no matter how small—whether it be technical, sales or service related.

In fact, the only thing extra you get from Compaq is, well, mark-up. For more details, look inside.

TO ORDER, CALL

800-284-7711

HOURS: 7 AM-9 PM CT M-F / 8 AM-4 PM CT SAT.

In Canada 800-387-5752. In the U.K. 0800 414535. In France
(1) 30.60.68.00. In Germany 06103/701-0. In Sweden 0760-713 50.

DELL
COMPUTER
CORPORATION